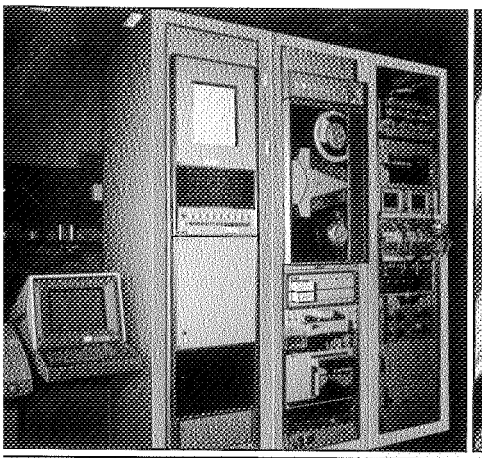
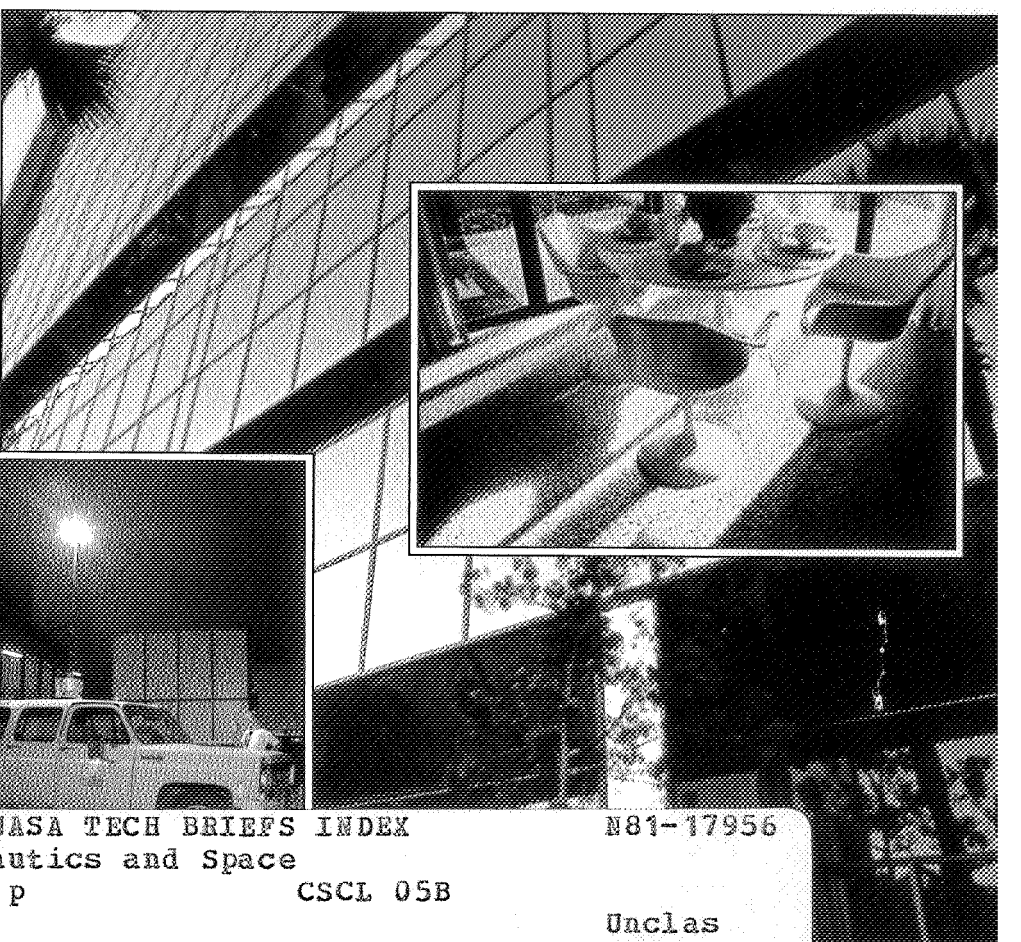
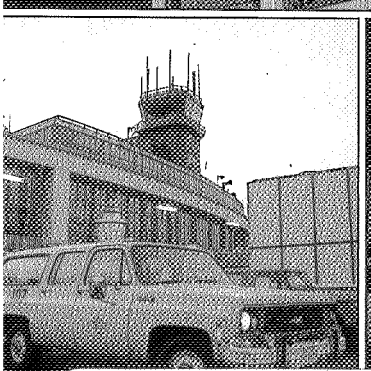
NASA Tech Briefs Index 1979

National Aeronautics and Space Administration







(NASA-SP-5021(21)) NASA TECH BRIEFS INDEX N81-17956
1979 (National Aeronautics and Space
Administration) 108 p CSCL 05B

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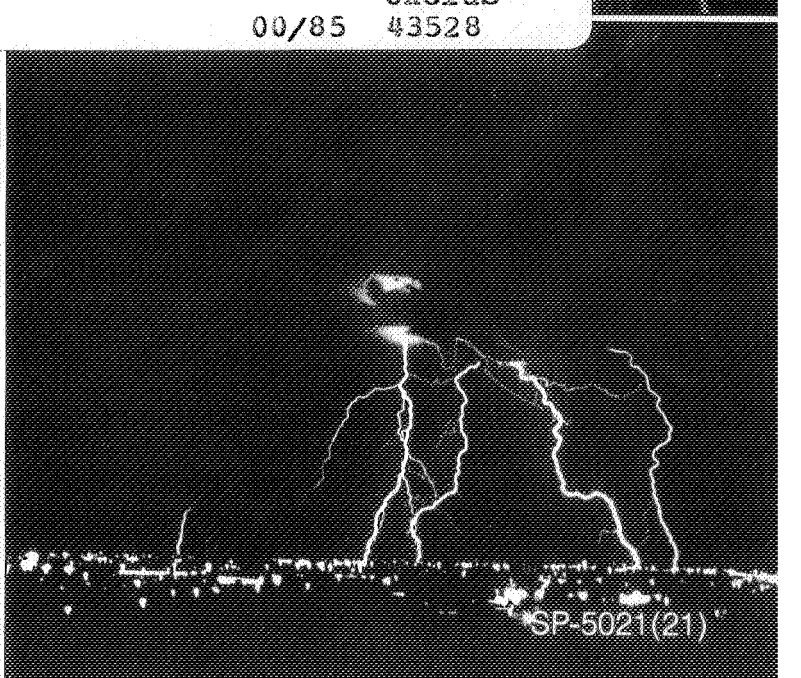

Vol. 4 (Nos. 1-4) 1979

SP-5021(21)

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INTRODUCTION

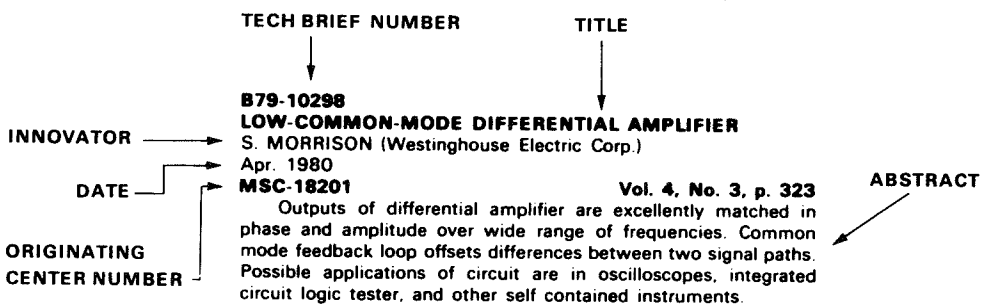
Tech Briefs are short announcements of new technology derived from the research and development activities of the National Aeronautics and Space Administration. These briefs emphasize information considered likely to be transferrable across industrial, regional, or disciplinary lines and are issued to encourage commercial application.

This *Index to NASA Tech Briefs* contains abstracts and four indexes -- subject, personal author, originating Center, and Tech Brief number -- for 1979 Tech Briefs.

Abstract Section

The abstract section is divided into nine categories: Electronic Components and Circuits; Electronic Systems; Physical Sciences; Materials; Life Sciences; Mechanics; Machinery; Fabrication Technology; and Mathematics and Information Sciences. Within each category, abstracts are arranged sequentially by Tech Brief number.

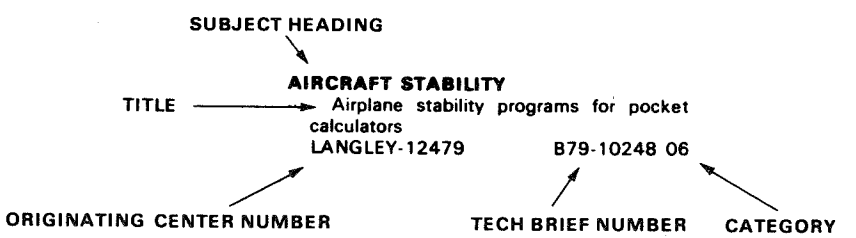
A typical abstract entry has these elements:



The originating Center number in each entry includes an alphabetical prefix that identifies the NASA Center where the Tech Brief originated. A list of prefixes and the corresponding Center names are given on page iii.

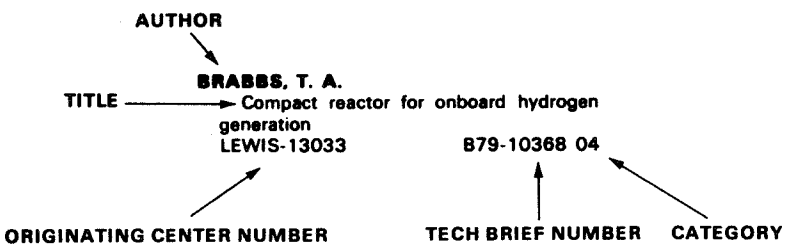
Indexes

Four indexes are provided. The first is a subject index, arranged alphabetically by subject heading. Each entry in the subject index includes a Tech Brief number and a category number to aid the user in locating pertinent entries in the abstract section.

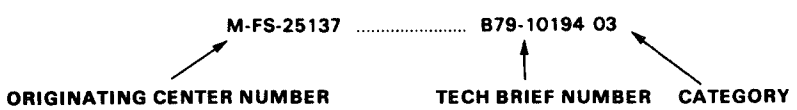


The January 1976 edition of the *NASA Thesaurus* (NASA SP-7050) is used as the authority for the indexing vocabulary that appears in the subject index. The *NASA Thesaurus* should be consulted in examining the current indexing vocabulary, including associated cross-reference structure. Only the subject terms that have been selected to describe the documents abstracted in this issue appear in the subject index. Copies of the *NASA Thesaurus* may be obtained from the National Technical Information Service at $23.50 for the two-volume set.

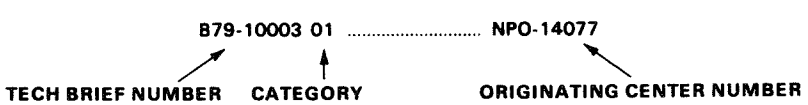
The second index is a personal author index. Entries in this index are arranged alphabetically by author's name. Tech Brief and category numbers are supplied to help the user find the appropriate entries in the abstract section.



The third index relates each originating Center number to the corresponding Tech Brief number and category. Entries in this index are arranged in alphanumeric order by Center number.



The fourth index relates each Tech Brief number to its originating Center number. Entries are arranged in ascending Tech Brief number order.



Originating Center Prefixes

ARC	Ames Research Center
FRC	Dryden Flight Research Center
GSFC	Goddard Space Flight Center
HQ	NASA Headquarters
KSC	Kennedy Space Center
LANGLEY	Langley Research Center
LEWIS	Lewis Research Center
M-FS	Marshall Space Flight Center
MSC	Johnson Space Center (formerly Manned Spacecraft Center)
NPO	Jet Propulsion Laboratory/NASA Pasadena Office

Availability of NASA Tech Briefs

Distribution of *NASA Tech Briefs*, a quarterly publication, is limited to managers and engineers in U.S. Industry and to other qualified technology transfer agents, such as; members of the media, teachers, librarians, and professionals supporting domestic commerce and industry.

Requests for individual Tech Briefs or for copies of the quarterly publication should be addressed to the Director, Technology Transfer Division Office, P.O. Box 8757, Baltimore/Washington International Airport, Maryland 21240.

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June 1980

Abstract Section

01 ELECTRONIC COMPONENTS AND CIRCUITS

B79-10001
WRAPAROUND-CONTACT SOLAR CELLS
C. R. BARAONA, T. M. KLUCHER, J. W. THORNHILL (Spectrolab, Inc.), and J. SCOTT-MONCK (Spectrolab, Inc.)
Aug. 1979 See also NASA-CP-2020 (N78-13527); NASA-CR-135202 (N77-32590)
LEWIS-13089 **Vol. 4, No. 1, p. 3**

Positive and negative electrical contacts are on back surface of wraparound-contact solar cell. With both terminals on nonilluminated side, cells can be connected back-to-back, and interconnection of many cells can be automated by using printed-circuit techniques. Cells are made by screen-printing layer of dielectric around edge of cell and extending top contact over dielectric to back surface. Wraparound also facilitates application of transparent covers and encapsulants. Efficiencies of cells are in excess of seventeen percent.

B79-10002
EFFICIENT DICHROIC PLATE FOR MICROWAVES
T. E. WISE (Bendix Corp.)
Aug. 1979
GSFC-12171 **Vol. 4, No. 1, p. 4**

Signal separator for dual-frequency antennas has interlaced crossed slots, or dipole elements. Plate reflects or transmits more efficiently than conventionally-designed microwave dichroic plates in which elements are not interlaced. Interlaced plate also increases bandwidth of dual-frequency antenna in which it is used.

B79-10003
LOW-BACKLOBE MICROWAVE TRANSMITTING HORN
D. A. BATHKER, S. A. BRUNSTEIN, P. W. CRAMER, and W. N. MOULE
Aug. 1979
NPO-14077 **Vol. 4, No. 1, p. 5**

By superimposing two hybrid modes, backlobes of S-band gain calibration horn are down 70 to 80 dB.

B79-10004
FAST-RESPONSE POWER SAVER FOR INDUCTION MOTORS
F. J. NOLA
Aug. 1979 See also B77-10154
M-FS-23988 **Vol. 4, No. 1, p. 6**

With control circuit, induction motors run more efficiently at light loads and respond to sudden load changes. It also anticipates power needs so that motor can respond instantly (to a load applied by a clutch, for example).

B79-10005
VHF FREQUENCY MULTIPLIER
J. A. CUSACK (Motorola, Inc.)
Aug. 1979
NPO-13700 **Vol. 4, No. 1, p. 7**

Low-power step-recovery-diode frequency multiplier generates 361-MHz signal. Diode conducts when ac waveform is positive at its upper terminal. When voltage is negative, diode continues to conduct stored charge in its junction.

B79-10006
FIBER-OPTIC CROSSBAR SWITCH
C. H. BELL
Aug. 1979
KSC-11104 **Vol. 4, No. 1, p. 9**

Switch automatically crosspatches optical signals with little loss. Device is furnished with local control and remote control. Local control can be manual from control panel or by computer data bus. In remote control, switch is slaved to remote manual panel computer data bus.

B79-10007
IMPROVED INSB PHOTODIODE PREAMPLIFIER CIRCUIT
R. L. ULRICH
Aug. 1979
NPO-14418 **Vol. 4, No. 1, p. 9**

Integrator compensates for background noise in Fourier spectrometer. Compensation is automatic.

B79-10008
DECISION-DIRECTED AUTOMATIC GAIN CONTROL
W. J. WEBER, III
Aug. 1979
NPO-13639 **Vol. 4, No. 1, p. 10**

Logic circuitry determines whether gain fluctuation are result of signal-strength changes or of a typical strings of like data symbols. Automatic Gain Control (AGC) system provides tight control that is independent of short-term, average, received signal energy and has negligible degrading effect on probability of error for signal.

B79-10009
SELF-CALIBRATING THRESHOLD DETECTOR FOR NOISY SIGNALS
J. R. BARNES (TRW, Inc.) and M. Y. HUANG (TRW, Inc.)
Aug. 1979
MSC-16370 **Vol. 4, No. 1, p. 10**

Single time-shared channel is not seriously affected by temperature and aging. Circuit should also be useful in industrial and consumer equipment. For example, it might be incorporated in telemetry for security systems.

B79-10010
LOW-FREQUENCY ATTENUATOR CIRCUIT
W. H. CASH, JR. (Martin Marietta Corp.) and J. T. POLYHEMUS (Martin Marietta Corp.)

Aug. 1979
FRC-11012 **Vol. 4, No. 1, p. 11**

Circuit uses only single operational amplifier and few passive components to remove background noise from miniature 'wristwatch' pulse detector. It can be applied to other systems where background noise is slowly varying, such as ultrasonics, strain-gage sensors, and accelerometers.

B79-10011
LOW-NOISE CURRENT REGULATOR
J. BUNN (Xerox Corp.)
Aug. 1979
NPO-14070 **Vol. 4, No. 1, p. 12**

Modification of conventional regulator minimizes current drift. Current to be regulated flows through sensing resistor in series with load, producing voltage that is fed into operational amplifier. Other input into amplifier is reference voltage from Zener diode network.

B79-10012
IMPROVED ISOLATION IN DOUBLE-BALANCED MIXERS
P. H. STANTON
Aug. 1979
NPO-14415 **Vol. 4, No. 1, p. 13**

Bypass circuit eliminates unwanted leakage in output RF signal. Correction circuit was developed for phase-shift-keyed transmitters. Principle can be adapted to correct leakage in other types of RF circuitry as well.

B79-10013
RELIABILITY OF IMAGING CCD'S
J. R. BEAL (Martin Marietta Corp.), M. D. BORENSTEIN (Martin Marietta Corp.), R. A. HOMAN (Martin Marietta Corp.), D. L. JOHNSON (Martin Marietta Corp.), D. D. WILSON (Martin Marietta Corp.), and V. F. YOUNG (Martin Marietta Corp.)
Aug. 1979 See also NASA-MCR-78752 (N78-29352)
M-FS-25039 **Vol. 4, No. 1, p. 14**

Report on reliability of imaging charge-coupled devices (CCD's) is intended to augment rather meager existing information on CCD reliability. Study focuses on electrical and optical performance tests, packaging constraints, and failure modes of one commercially available device (Fairchild CCD121H).

B79-10014
GROUP-DELAY STANDARDS
R. W. BEATTY, L. J. DERR, and T. Y. OTOSHI
Aug. 1979
NPO-13938 **Vol. 4, No. 1, p. 14**

Delay-line standards have been tested by three independent laboratories using six different methods. Results are published in report showing delay values obtained from 15-, 30-, and 60-ns cables by different laboratories. Study of potential error sources indicates that reflection errors due to discontinuities at ends of cables are usually small.

B79-10154
COMPUTATION-SAVING DIGITAL FILTER
D. J. SOWADA (Honeywell, Inc.)
Dec. 1979
MSC-18057 **Vol. 4, No. 2, p. 167**

Two stage digital low-pass filter circuit that averages input over given period and filters average over comparatively slow rate, reduces computation, speed, and word-length requirements. Applications include data preprocessing before entry to central processor.

B79-10155
IMPROVED SILICON/CARBON INTERFACE FOR SOLAR CELLS
D. J. ZOOK (Honeywell, Inc.)
Dec. 1979
NPO-14421 **Vol. 4, No. 2, p. 168**

Resistance measurements showing that vitreous graphite remains almost wholly intact even after 1 hour of contact with silicon melt indicates that vitreous carbon may be superior to rubbed-on graphite as interface between ceramic substrate and silicon layer of solar cell.

B79-10156
IMPROVED METALIZED POLYCARBONATE CAPACITOR
H. J. KELLERMAN (Component Research Co.)
Dec. 1979 See also NASA-CR-150460 (N77-85673)
M-FS-25142 **Vol. 4, No. 2, p. 168**

Modified metallized polycarbonate-film capacitor withstands 500 thermal cycles between 55 and 125 C replacing conventional devices which typically withstand 10 such cycles.

B79-10157
BINARY-TO-MANCHESTER ENCODERS
R. H. ST.CYR, III (Rockwell International Corp.), W. HU (The Garrett Corp.), and R. LATSHAW (The Garrett Corp.)
Dec. 1979
MSC-16546 **Vol. 4, No. 2, p. 169**

Two circuit system converts 16-bit-word binary encoded data to 24-bit Manchester II code to allow easy interface of flight simulators with aircraft communications equipment.

B79-10158
VERSATILE DIGITAL SIGNAL PROCESSOR FOR DC TO DC CONVERTERS
J. L. BIESS (TRW, Inc.), L. Y. INOUYE (TRW, Inc.), and Y. YU (TRW, Inc.)
Dec. 1979 See also NASA-CR-135072 (N77-32398)
LEWIS-13020 **Vol. 4, No. 2, p. 170**

Digital signal processor (DSP) for dc-to-dc converters, processes all incoming signals and transmits correct signal to operate power switch.

B79-10159
DIGITAL PHASE SHIFTER
M. G. PERRY (Vought Corp.)
Dec. 1979
LANGLEY-12338 **Vol. 4, No. 2, p. 171**

Device requiring only TTL integrated circuits and single 5-volt power supply, varies phase shift of digital input over approximate range of 15 to 165 deg.

B79-10160
IMPROVED READER FOR MAGNETICALLY-ENCODED ID CARDS
T. T. WU (Caltech)
Dec. 1979
NPO-13517 **Vol. 4, No. 2, p. 172**

Hybrid demodulator in electronic card reader for magnetically encoded identification cards, accommodates variations in insertion speeds, yet is simpler and less expensive than equivalent all-digital circuits.

B79-10161
TRANSDUCER WITH A SENSE OF TOUCH
A. K. BEJCZY (Caltech) and G. PAINE (Caltech)
Dec. 1979
NPO-14656 **Vol. 4, No. 2, p. 173**

Matrix of pressure sensors determines shape and pressure distribution of object in contact with its surface. Output can be used to develop pressure map of objects' surface and displayed as array of alphanumeric symbols on video monitor.

B79-10162
PHOTOCAPACITIVE INFRARED DETECTOR AND SOLAR CELL
R. K. CROUCH, W. E. MILLER, J. A. MORIARTY (College of William and Mary), A. SHER (College of William and Mary), and Y. H. TSUO (College of William and Mary)
Dec. 1979
LANGLEY-12345 **Vol. 4, No. 2, p. 174**

Lightly doped semiconductor device, with transparent insulating layer based on capacitive response to radiant energy, exhibits excellent sensitivities at room temperature.

B79-10163
OFFSET COMPENSATION FOR A/D CONVERTERS
S. S. BROKL (Caltech) and W. J. HURD (Caltech)
Dec. 1979
NPO-13438 **Vol. 4, No. 2, p. 176**

Analog-to-digital (A/D) converter eliminates dc offset in final digitized signal as well as in analog input by using digital feedback for compensation. Circuit could prove useful in data processing applications in which analog-format data are entered at high rates, as in point-of-sale data input systems.

B79-10164
IMPROVED RIPPLE REJECTION IN A PWM
C. B. LOFTIS, JR. (Watkins-Johnson Co.)
Dec. 1979
MSC-16923 **Vol. 4, No. 2, p. 177**

Line-ripple rejection of pulse-width modulator is more than doubled by substituting exponentially increasing ramp voltage for conventional linear ramp, yet circuit is simplified.

B79-10165
DEVELOPMENT OF CMOS INTEGRATED CIRCUITS
F. BERTINO (RCA Corp.), A. FELLER (RCA Corp.), J. GREENHOUSE (RCA Corp.), T. LOMBARDI (RCA Corp.), A. MERRIAM (RCA Corp.), R. NOTO (RCA Corp.), S. OZGA (RCA Corp.), R. PRYOR (RCA Corp.), P. RAMONDETTA (RCA Corp.), and A. SMITH (RCA Corp.)
Dec. 1979 See also NASA-CR-150801 (N78-78414)
M-FS-25121 **Vol. 4, No. 2, p. 178**

Report documents life cycles of two custom CMOS integrated circuits: (1) 4-bit multiplexed register with shift left and shift right capabilities, and (2) dual 4-bit registers. Cycles described include conception as logic diagrams through design, fabrication, testing, and delivery.

B79-10294
INDUCTORLESS TUNED CIRCUIT FOR HIGH FREQUENCIES
L. KLEINBERG
Apr. 1980
GSFC-12410 **Vol. 4, No. 3, p. 319**

Inductorless tuned circuit functions as filter, amplifier, or oscillator at radio frequencies. Circuit is based on two directly-coupled transistors operated at their transition frequency and fabricated as integrated circuit on single silicon chip.

B79-10295
TEMPERATURE CONTROLLER FOR CRYSTAL RESONATORS
T. R. TURLINGTON (Westinghouse Electric Corp.)
Apr. 1980
NPO-14507 **Vol. 4, No. 3, p. 320**

Controller operates on less than 5W prime power and heats crystal from -10 C to 75 C in less than 45s. Unit is faster and more accurate (to within 0.7 C) than other inexpensive controllers and faster and less expensive than very precise controllers in vacuum flasks.

B79-10296
DIRECT-CURRENT DRIVE FOR AC MOTORS
J. N. SOLARIO (Caltech)
Apr. 1980
NPO-14427 **Vol. 4, No. 3, p. 321**

Dual windings of ac motor serve as output transformer for dc/ac inversion. Method makes use of low-cost commutatorless ac motors, powered by solar energy, batteries and other dc sources possible.

B79-10297
MEASURING SIGNAL-TO-NOISE RATIO AUTOMATICALLY
L. A. BERGMAN (Caltech) and A. R. JOHNSTON (Caltech)
Apr. 1980
NPO-14582 **Vol. 4, No. 3, p. 322**

Automated method of measuring signal-to-noise ratio in digital communication channels is more precise and 100 times faster than previous methods used. Method based on bit-error-rate (B&R) measurement can be used with cable, microwave radio, or optical links.

B79-10298
LOW-COMMON-MODE DIFFERENTIAL AMPLIFIER
S. MORRISON (Westinghouse Electric Corp.)
Apr. 1980
MSC-18201 **Vol. 4, No. 3, p. 323**

Outputs of differential amplifier are excellently matched in phase and amplitude over wide range of frequencies. Common mode feedback loop offsets differences between two signal paths. Possible applications of circuit are in oscilloscopes, integrated circuit logic tester, and other self contained instruments.

B79-10299
BIDIRECTIONAL MANCHESTER REPEATER
J. FERGUSON (Rockwell International Corp.)
Apr. 1980
MSC-18414 **Vol. 4, No. 3, p. 324**

Bidirectional Manchester repeater is inserted at periodic intervals along single bidirectional twisted pair transmission line to detect, amplify, and transmit bidirectional Manchester 11 code signals. Requiring only 18 TTL 7400 series IC's, some line receivers and drivers, and handful of passive components, circuit is simple and relatively inexpensive to build.

B79-10300
SOLID-STATE POWER CONTROLLER
D. A. FOX (Westinghouse Electric Corp.) and J. S. FULLEMANN (Westinghouse Electric Corp.)
Apr. 1980
MSC-16661 **Vol. 4, No. 3, p. 325**

Compact, solid state, electric-power controller switches power on and off at remote load, limits current drawn by load, and shuts off (with 2- to 3- second trip time) in case of short circuit. Lightweight efficient hybrid unit operates at 28 volts dc and at maximum currents of from 3 to 2 amperes.

B79-10301
VOLTAGE-CONTROLLED ATTENUATOR WITH LOW PHASE SHIFT
G. F. LUTES, JR. (Caltech)
Apr. 1980
NPO-14347 **Vol. 4, No. 3, p. 326**

Five megahertz RF (radiofrequency) signal attenuator utilizing RF quadrature hybrid, and optically viable-resistance load controlled by lamp circuit exhibits little phase shift. Circuit is designed to help distribute standard RF signal of controlled amplitude, and phase throughout complex of facilities could be useful in application to precision test equipment and communication electronics.

B79-10302
IMPROVED INSULATOR LAYER FOR MIS DEVICES
W. E. MILLER
Apr. 1980
LANGLEY-12455 **Vol. 4, No. 3, p. 327**

Insulating layer of supersonic conductor such as LaF sub 3 has been shown able to impart improved electrical properties to photoconductive detectors and promises to improve other metal/insulator/semiconductor (MIS) devices, e.g., MOSFET and integrated circuits.

B79-10303
MINIMIZING SPIKES IN SWITCHING-REGULATOR CIRCUITS
W. T. MCLYMAN (Caltech)
Apr. 1980
NPO-14505 **Vol. 4, No. 3, p. 328**

Circuit, employing tapped inductor to back-bias rectifying diodes and extra diode to cummutate current, minimizes current spikes that cause premature transistor failure in switching-regulator circuits.

B79-10304
DIGITAL AUTOMATIC GAIN CONTROL

Z. UZDY (Caltech)
Apr. 1980
NPO-14236 **Vol. 4, No. 3, p. 329**

Performance analysis, used to evaluated fitness of several circuits to digital automatic gain control (AGC), indicates that digital integrator employing coherent amplitude detector (CAD) is best device suited for application. Circuit reduces gain error to half that of conventional analog AGC while making it possible to automatically modify response of receiver to match incoming signal conditions.

B79-10305
SURGE PROTECTION WITH AUTOMATIC RESET
R. B. CHAN (Hughes Aircraft Co.) and M. C. SINELLI (Hughes Aircraft Co.)
Apr. 1980
MSC-18356 **Vol. 4, No. 3, p. 329**

Circuit turns power off automatically when surge occurs and restores power when voltage returns to normal. Transmitters and other equipment are protected in electrically noisy environments; however, if three transient overvoltages (or continuous overvoltage) are sensed within 3.2 seconds, circuit turns power supply off permanently since serious failure may have occurred.

B79-10306
BUBBLE-DOMAIN DETECTOR
R. L. STERMER and C. D. NICHOLS
Apr. 1980
LANGLEY-12241 **Vol. 4, No. 3, p. 330**

Bubble domain detector employs transformer coupling for data retrieval. Method makes multidetection practical by time multiplexing. Multiplexer matrices can be scaled in 4 by 4, 4 by 8, 4 by 16, or larger combinations without diode steering.

B79-10307
CMOS ANALOG SWITCHES FOR ADAPTIVE FILTERS
C. E. DIXON (Motorola, Inc.)
Apr. 1980
NPO-14442 **Vol. 4, No. 3, p. 332**

Adaptive active low-pass filters incorporate CMOS (Complimentary Metal-Oxide Semiconductor) analog switches (such as 4066 switch) that reduce variation in switch resistance when filter is switched to any selected transfer function.

B79-10308
MEASURING CHARGE NONUNIFORMITY IN MOS DEVICES
J. MASERJIAN (Caltech) and N. ZAMANI (Caltech)
Apr. 1980
NPO-14585 **Vol. 4, No. 3, p. 333**

Convenient method of determining inherent lateral charge non-uniformities along silicon dioxide/silicon interface of metal-oxide-semiconductor (MOS) employs rapid measurement of capacitance of interface as function of voltage at liquid nitrogen temperature. Charge distribution is extracted by fast-Fourier-transform analysis of capacitance voltage (C-V) measurement.

B79-10309
VARIABLE-CLOCK-RATE A/D CONVERTER
P. C. LIPOMA (Lockheed Electronics Co.)
Apr. 1980
MSC-18541 **Vol. 4, No. 3, p. 333**

Analog-to-digital (A/D) converter operates at two different rates (slow and fast) so that low amplitude noise is reduced without loss of transient response. During tracking, when sensitivity is important, slow clock reduces noise. In search mode, when signal may change rapidly, fast clock ensures rapid response.

B79-10310
STRAIN RELIEF FOR POWER-CABLE CONNECTORS
W. T. DEAN, III (Rockwell International Corp.)
Apr. 1980
MSC-19497 **Vol. 4, No. 3, p. 334**

Easily fabricated grommet composed of polytetrafluoroethylene cylinder, containing U-shaped channels equally spaced around periphery, is used in power cable connectors to relieve strain on cables. Utilization of grommets provides more ease in cable insertion and removal. Potential applications include wiring in large residential and commercial buildings.

B79-10311
INTERLEAVED SHIELDING FOR CABLES
G. R. READ (Rockwell International Corp.)
Apr. 1980
MSC-18369 **Vol. 4, No. 3, p. 335**

Interleaved wrapping of metal foil shielding on power cables gives more effective electromagnetic interference protection without increasing amount of material or weight.

B79-10312
ISOLATOR/RETAINER FOR CONNECTORS
J. L. ALPENIA (Rockwell International Corp.) and W. F. ELLIS (Rockwell International Corp.)
Apr. 1980
MSC-18527 **Vol. 4, No. 3, p. 335**

Double-ended cap holds mating plugs and receptacle, preventing electrical contact between them when not in use. Cap maintains continuous electrical ground between plug and receptacle protecting against electromagnetic-interference pickup. Device is also useful for isolation of sensitive circuits from each other during storage, transit, or testing.

B79-10313
STABLE S-BAND POWER AMPLIFIER
C. E. HERMESMEYER (Motorola, Inc.)
Apr. 1980
NPO-14443 **Vol. 4, No. 3, p. 336**

Relatively linear amplifier with automatic level control (ALC) preserves modulation characteristics of phase-shift-key (PSK) modulated S-band transmitter.

B79-10314
LIMITING AMPLIFIER FOR MICROWAVES
J. N. OWENS (Hughes Aircraft Co.)
Apr. 1980
MSC-18471 **Vol. 4, No. 3, p. 337**

Limiting amplifier, using gallium arsenide field effect transistor (FET), delivers constant-amplitude drive signal to KU-band traveling wave tube (TWT) thus preventing distortion in output from TWT.

B79-10315
MOISTURE PENETRATION IN MICROCIRCUIT PACKAGES
J. J. LICARI (Rockwell International Corp.) and K. L. PERKINS (Rockwell International Corp.)
Apr. 1980
M-FS-25087 **Vol. 4, No. 3, p. 338**

Results of study of hybrid microcircuit packages tested in temperature/humidity environments ranging from 25 C at 98 percent relative humidity (RH) to 85 C at 85 percent RH shows that package susceptibility to moisture is affected more by high temperature than humidity, and room temperature tests are inadequate for testing package seal integrity.

B79-10444
VARIABLE-RESOLUTION COUNTER
J. I. CLEMMONS, JR.
Jun. 1980
LANGLEY-12530 **Vol. 4, No. 4, p. 463**

Variable-resolution counter circuit increases time interval that n-bit binary counter can measure by using multivalue input clock. Circuit allows measurement of time intervals beyond capability of single n-bit counter while maintaining reasonable resolution.

B79-10445
WINDOW COMPARATOR FOR VOLTAGES
J. M. BLACK
Jun. 1980
FRC-10090 **Vol. 4, No. 4, p. 464**

Circuit determines whether voltage is within preselected range of voltage levels. Device requires fewer components than previous window comparators and is less susceptible to errors from

reference drift. Comparator is useful in process-control circuitry, measuring instruments, and checkout equipment.

B79-10446
LOW-EMI SOLID-STATE RELAY
W. D. MUSKA (United Aircraft Corp.)
Jun. 1980
MSC-12698 **Vol. 4, No. 4, p. 465**

Solid state relay electromagnetic interference (EMI) generated when switching ac power to load. Relay could find uses in circuits that are particularly susceptible to electrical noise or contain sensitive components.

B79-10447
REAL-TIME DIGITAL INTEGRATOR
A. L. RUBIN (Caltech), H. TAYLOR (Caltech), and D. E. WALLIS (Caltech)
Jun. 1980
NPO-14530 **Vol. 4, No. 4, p. 465**

Field programmable logic array (FPLA) is used to make 3-bit arithmetic logic unit (ALU) for large integrator that can be read and cleared while new data is added to begin new integral. Arrangement of device can provide for full carry/lookahead capability with minimum gate delays.

B79-10448
BIASED-RECEIVER DIGITAL INTERFACE
F. C. FITZGERALD (IBM Corp.)
Jun. 1980
MSC-14968 **Vol. 4, No. 4, p. 466**

Coupling circuits converts TTL signals to higher voltage, higher current logic with good noise rejection. Depending on selected components, circuit may also be adapted to low-power applications.

B79-10449
SENSOR/AMPLIFIER FOR WEAK LIGHT SOURCES
D. J. DESMET (Univ. of Alabama), A. J. JASON (Univ. of Alabama), and A. C. PARR (Univ. of Alabama)
Jun. 1980
M-FS-25025 **Vol. 4, No. 4, p. 467**

Light sensor/amplifier circuit detects weak light converts it into strong electrical signal in electrically noisy environment. Circuit is relatively simple and uses inexpensive, readily available components. Device is useful in such applications as fire detection and photographic processing.

B79-10450
OVERLOAD PROTECTION FOR SWITCHING REGULATORS
E. LACHOCHI (RCA Corp.)
Jun. 1980
MSC-18513 **Vol. 4, No. 4, p. 468**

Circuit protects all output lines of switching regulator against overloads without requiring current sensors on every line. If overload is sensed, device short circuits bias on switching transistor so that power is rapidly cut off from loads. Circuit also includes delay network to inhibit erroneous operation during startup.

B79-10451
AZIMUTH CORRELATOR DESIGN FOR IC CHIP
V. C. TYREE (Caltech) and C. WU (Caltech)
Jun. 1980
NPO-14614 **Vol. 4, No. 4, p. 469**

Azimuth correlator circuit synthetic-aperature radar (SAR) is designed for single integrated circuit (IC) chip. Azimuth correlator modules constructed with sets of such chips could make real-time signal processing possible. Primary advantages are realized in areas of weight and power requirement reductions.

B79-10452
RISE-TIME CONTROL IN SATURATED AMPLIFIERS
C. E. THEALL (The Singer Co.)
Jun. 1980
MSC-14934 **Vol. 4, No. 4, p. 470**

Inductor in transistor emitter circuit controls output rise time of saturated amplifier thereby reducing radiated noise and distortion in subsequent circuits. Device also improves current balancing in push/pull transformer circuits. Resulting circuits are self compensating for temperature.

B79-10453
LOW-COST, LIGHTWEIGHT RF TRANSFER SWITCH
D. L. OLSSON (TRW, Inc.)
Jun. 1980
MSC-16907 **Vol. 4, No. 4, p. 472**

Low cost miniature DPDT 'half-size-crystal-can' relay serves as RF transfer switch for 1.0-W S-band signals. Switch can be used in miniature communication equipment operations at vhf-to-microwave frequencies. Device presents principal gains over conventional RF switches on space saving, and weight and cost reduction.

B79-10454
A RELIABLE SOLID-STATE RF TRANSFER SWITCH
R. W. DODD (Watkins-Johnson Co.)
Jun. 1980
MSC-16890 **Vol. 4, No. 4, p. 472**

Highly-reliable lightweight solid-state RF (radio frequency) transfer switch replaces less reliable mechanical switch in handling medium power for S-band power amplifier.

B79-10455
SEMICONDUCTOR STEP-STRESS TESTING
H. B. MEEKS and F. VILLELLA
Jun. 1980 See also B79-10456 - B79-10475
M-FS-25329 **Vol. 4, No. 4, p. 473**

Report documents behavior of discrete diodes and transistors in extensive power and temperature overstress tests. Thirty nine devices were tested in groups designated: (1) power overstress, and (2) and (3) temperature overstress. Results are of interest to users of tested components and engineers in conduction of similar tests.

B79-10456
JANTX1N645-1 DIODE
Innovator not given (Special Products Division of DCA Reliability Lab.) Jun. 1980 See also B79-10455; B79-10457 - B79-10475
M-FS-25243 **Vol. 4, No. 4, p. 474**

Samples manufactured by Semtech were tested. Devices showed excessive reverse leakage currents during each of three test phases. Results of testing suggest that failures occurred because of static charge on surface of encapsulant, caused by thermal decomposition of paint.

B79-10457
JANTX1N649-1 DIODE
Innovator not given (Special Products Division of DCA Reliability Lab.) Jun. 1980 See also B79-10455; B79-10456; B79-10458; - B79-10475
M-FS-25344 **Vol. 4, No. 4, p. 474**

Samples manufactured by Semtech and Micro Semiconductor were tested. Both lots did quite well in tests. Plot showing cumulative failure distribution for group 2 was drawn for both lots. Graphs for groups 1 and 3 failures could not be drawn because of extremely low occurrence.

B79-10458
JANTX/N746A DIODE
Innovator not given (Special Products Division of DCA Reliability Lab.) Jun. 1980 See also B79-10455 - B79-10457; B79-10459 - B79-10475
M-FS-25245 **Vol. 4, No. 4, p. 474**

Samples manufactured by Siemens and Motorola were tested. Both lots did well in groups 1 and 3 testing. Failure analysis was done for group 2 tests because of excessive reverse-leakage-current failure mode.

B79-10459
JANTX/N759A VOLTAGE REGULATING DIODE
Innovator not given (Special Products Div. of DCA Reliability Lab.) Jun. 1980 See also B79-10455 - B79-10458; B79-

10460 - B79-10475
M-FS-25246 **Vol. 4, No. 4, p. 475**
Diodes manufactured by Texas Instruments and Siemens performed well in group 1 testing. Failure analysis shows that group 2 testing is most detrimental to both sample lots. Same failure mode of excessive I(sub) R leakage can be clearly seen in group 3 testing.

B79-10460
JANTX/N937B ZENER DIODE
Innovator not given (Special products Division of DCA Reliability Lab.) Jun. 1980 See also B79-10455 - B79-10459; B79-10461 - B79-10475
M-FS-15247 **Vol. 4, No. 4, p. 475**
Zener diodes manufactured by Motorola and Siemens were tested. Apparent failure mode in all three groups was B (sub) V (Zener-breakdown-voltage) minimum failure. Both manufacturers had approximately same amount of failure in each testing.

B79-10461
JANTX/N972B ZENER DIODE
Innovator not given (Special Products Division of DCA Reliability Lab.) Jun. 1980 See also B79-10455 - B79-10460; B79-10462 - B79-10475
M-FS-25248 **Vol. 4, No. 4, p. 475**
Tested Zeners were manufactured by Siemens and Motorola. Devices tested in groups 1 and 2 did quite well. Notable damage to both manufacturer lots occurred in group 2 testing.

B79-10462
JANTX/N98B ZENER DIODE
Innovator not given (Special Products Division of DCA Reliability Lab.) Jun. 1980 See also B79-10455 - B79-10461; B79-10463 - B79-10475
M-FS-25249 **Vol. 4, No. 4, p. 475**
Tested diodes were manufactured by Motorola and Siemens. Both sample lots performed well in groups 1 and 3 testing. Group 2 testing was most detrimental of three groups. Extreme heat was big factor in failure mode.

B79-10463
JANTX/N1202A SWITCHING DIODE
Innovator not given (Special Products Division of DCA Reliability Lab.) Jun. 1980 See also B79-10455 - B79-10462; B79-10464 - B79-10475
M-FS-25250 **Vol. 4, No. 4, p. 475**
General Electric and International Rectifier switching diodes were tested. Group 2 testing proved to be most damaging to both lots. In group 2 testing many visual failures were seen in samples from both manufacturers.

B79-10464
JANTX1N3893 DIODE
Innovator not given (Special Products Division of DCA Reliability Lab. Jun. 1980 See also B79-10455 - B79-10463; B79-10465 - B79-10475
M-FS-25266 **Vol. 4, No. 4, p. 476**
Diodes manufactured by Siemens and Motorola were tested. Testing of Motorola diodes was stopped in all 3 groups because 50% failure-rate limit was reached. Siemens lot endured more testing in groups 1 and 2 and completed testing on group 3. Failure analysis was performed for group 2 testing.

B79-10465
JANTX1N4570A ZENER DIODE
Innovator not given (Special Products Division of DCA Reliability Lab.) Jun. 1980 See also B79-10455 - B79-10464; B79-10466 - B79-10475
M-FS-25268 **Vol. 4, No. 4, p. 476**
Siemens and Motorola diodes were tested. Of three stress groups, group 2 prove to be most detrimental to both sample lots.

B79-10466
JANTX1N5415 DIODE
Innovator not given (Special Products Division of DCA Reliability Lab.) Jun. 1980 See also B79-10455 - B79-10465; B79-10467 - B79-10475
M-FS-25270 **Vol, 4, No. 4, p. 476**
Tested diodes were manufactured by Semtech and Micro Semiconductor. Micro Semiconductor diodes experienced no failures in groups 2 and 3 testing and only four failures in group 1.

B79-10467
JANTX1N5417 DIODE
Innovator not given (Special Products Division of DCA Reliability Lab.) Jun. 1980 See also B79-10455 - -B79-10466; B79-10468 - B79-10475
M-FS-25271 **Vol. 4, No. 4, p. 476**
Tested diodes were manufactured by Micro Semiconductor and Semtech. Significant damage occurred only in group 1 testing.

B79-10468
JANTX1N5420 DIODE
Innovator not given (Special Products Division of DCA Reliability Lab.) Jun. 1980 See also B79-10455 - B79-10467; B79-10469 - B79-10475
M-FS-25272 **Vol. 4, No. 4, p. 476**
Testing of sample lots from Unitrode and Micro Semiconductor had to be stopped in group 1 test because 50% failure rate limit was reached. Failure analysis was performed only for group 2 testing because of apparent failure mode.

B79-10469
JANTX1N5550 SWITCHING DIODE
Innovator not given (Special Products Division of DCA Reliability Lab.) Jun. 1980 See also B79-10455 - B79-10468; B79-10470 - B79-10475
M-FS-25273 **Vol. 4, No. 4, p. 476**
Tested devices were manufactured by Semtech and Micro Semiconductor. Failure rate of Semtech diodes exceeded 50% in all three test groups. Failure mode could not be precisely determined.

B79-10470
JANTX1N5552 SWITCHING DIODE
Innovator not given (Special Products Division of DCA Reliability Lab.) Jun. 1980 See also B79-10455 - B79-10469; B79-10471 - B79-10475
M-FS-25274 **Vol. 4, No. 4, p. 477**
Switching diodes manufactured by Micro Semiconductor and Semtech were tested. In groups 2 and 3 there were no Micro Semiconductor catastrophic failures. Testing of both lots was stopped in group 1 test because of 50% failure rate.

B79-10471
JANTX1N5554 SWITCHING DIODE
Innovator not given (Special Products Division of DCA Reliability Lab.) Jun. 1980 See also B79-10455 - B79-10470; B79-10472 - B79-10475
M-FS-25275 **Vol. 4, No. 4, p. 477**
Micro Semiconductor and Semtech diodes were tested. In group 1 tests Micro Semiconductor and Semtech lot testing was stopped because of excess failure rate. Failure analysis was performed on groups 1 and 3 because of apparent failure mode.

B79-10472
JANTX1N5614 SWITCHING SIODE
Innovator not given (Special Products Division of DCA Reliability Lab.) Jun. 1980 See also B79-10455 - B79-10471; B79-10473 - B79-10475
M-FS-25276 **Vol. 4, No. 4, p. 477**
Diode manufactured by Micro Semiconductor and Semtech were tested. Main failure mode was surface inversions caused by leakage of contaminants through cracks in glass. Most failures in groups 2 and 3 were visual.

B79-10473
JANTX1N5615 SWITCHING DIODE
Innovator not given (Special Products Division of DCA Reliability Lab.) Jun. 1980 See also B79-10455 - B79-10472; B79-

10474 - B79-10475
M-FS-25277 **Vol. 4, No. 4, p. 477**
Diodes manufactured by Semtech and Micro Semiconductor were tested. Both sample lots exceeded 50% fail-rate in all groups. Failure analysis was performed for groups 2 and 3.

B79-10474
JANTX1N5618 SWITCHING DIODE
Innovator not given (Special Products Division of DCA Reliability Lab.) Jun. 1980 See also B79-10455 - B79-10473; B79-10475
M-FS-25278 **Vol. 4, No. 4, p. 478**
Diodes tested were manufactured by Semtech and Micro Semiconductor. Semtech sample lots completed all three testings with only one catastrophic failure. All three Micro Semiconductor lots had several failure that were submitted for failure analysis.

B79-10475
JANTX1N5619 DIODE
Innovator not given (Special Products Division of DCA Reliability Lab.) Jun. 1980 See also B79-10455 - B79-10474
M-FS-25279 **Vol. 4, No. 4, p. 478**
Tested diodes were manufactured by Semtech and Micro Semiconductor. Failures were experienced in groups 1 and 2 testing.

02 ELECTRONIC SYSTEMS

B79-10015
ELECTRONIC PICTURES FROM CHARGED-COUPLED DEVICES
D. H. MCCANN (Westinghouse Electric Corp.), A. P. TURLY (Westinghouse Electric Corp.), and M. WHITE (Westinghouse Electric Corp.)
Aug. 1979
GSFC-12324 **Vol. 4, No. 1, p. 17**
Imaging system uses charge-coupled devices (CCD's) to generate TV-like pictures with high resolution, sensitivity, and signal-to-noise ratio. It combines detectors for five spectral bands as well as processing and control circuitry all on single silicon chip.

B79-10016
IMPROVING LOW-ILLUMINATION VIDEO
R. L. SAPIRSTEIN (Lockheed Missiles & Space Co., Inc.)
Aug. 1979
MSC-14841 **Vol. 4, No. 1, p. 18**
Nonmoving TV pictures are improved by electronic system that removes much of the 'snow' or random noise in image. System integrates and averages picture elements in real time and thereby allows easier and more accurate evaluation of image, visually and by computer.

B79-10017
TV AUDIO AND VIDEO ON THE SAME CHANNEL
J. B. HOPKINS (Westinghouse Electric Corp.)
Aug. 1979
MSC-16241 **Vol. 4, No. 1, p. 19**
Transmitting technique adds audio to video signal during vertical blanking interval. SIVI (signal in the vertical interval) is used by TV networks and stations to transmit cuing and automatic-switching tone signals to augment automatic and manual operations. It can also be used to transmit one-way instructional information, such as bulletin alerts, program changes, and commercial-cutaway aural cues from the networks to affiliates. Additonally, it can be used as extra sound channel for second-language transmission to bilingual stations.

B79-10018
REAL-TIME VIDEO-IMAGE ANALYSIS
R. ESKENAZI, M. J. RAYFIELD, and Y. YAKIMOVSKY
Aug. 1979
NPO-14282 **Vol. 4, No. 1, p. 20**
Digitizer and storage system allow rapid random access to video data by computer. RAPID (random-access picture digitizer) uses two commercially-available, charge-injection, solid-state TV cameras as sensors. It can continuously update its memory with each frame of video signal, or it can hold given frame in memory. In either mode, it generates composite video output signal representing digitized image in memory.

B79-10019
ELIMINATING CLUTTER IN SYNTHETIC-APERTURE RADAR
A. JAIN
Aug. 1979
NPO-14035 **Vol. 4, No. 1, p. 21**
Diffusion technique reduces clutter noise in coherent SAR (synthetic-aperture radar) image signal without degrading its resolution. Technique makes radar-mapped terrain features more obvious. It also has potential application in holographic microscopy.

B79-10020
AZIMUTH CORRELATOR FOR SYNTHETIC APERTURE RADAR
W. E. ARENS
Aug. 1979
NPO-14019 **Vol. 4, No. 1, p. 22**
Azimuth correlation simulates large antenna aperture. It uses charge-coupled-device (CCD) technology to simplify complex, digital, signal-improvement process. In aircraft or spacecraft, correlator processes images onboard and in real time to simplify transmission to ground stations.

B79-10021
SIGNAL SEPARATOR FOR DUAL-FREQUENCY ANTENNA
R. W. HARTOP
Aug. 1979
NPO-14022 **Vol. 4, No. 1, p. 23**
Replacement for dichroic plate reduces noise. Besides being easier to install, flange is less expensive to fabricate. Most important, the flange reduces antenna contribution to system noise; whereas, dichroic plate increases noise temperature by 2 or 3 degrees.

B79-10022
COMPONENTS FOR AN S-BAND COMMUNICATION SUBSYSTEM
C. W. ROOK (Motorola, Inc.)
Aug. 1979
NPO-13955 **Vol. 4, No. 1, p. 24**
S-band communication components include low-pass filter, diplexer, and transmit output filter, which prevent radiation or coupling of unwanted transmitter spurious outputs and to provide isolation while transmitter and receiver operate simultaneously.

B79-10023
LED DISPLAY FOR SOLO AIRCRAFT INSTRUMENT NAVIGATION
R. K. CROUCH, W. L. KELLY, VI, L. J. LINA, and B. D. MEREDITH
Aug. 1979
LANGLEY-12292 **Vol. 4, No. 1, p. 26**
Solo pilot's task is made easier through convenient display of landing and navigation data. Use of display shows promise as more efficient means of presenting sequential instructions and data, such as course heading, altitude, and radio frequency, to minimize pilot's workload during solo instrument flight.

B79-10024
CABLE-FAULT LOCATOR
R. L. CASON, J. J. MCSTAY, and A. P. HEYMANN, SR. (Planning Research Corp.)
Aug. 1979
KSC-10899 **Vol. 4, No. 1, p. 27**
Inexpensive system automatically indicates location of

short-circuited section of power cable. Monitor does not require that cable be disconnected from its power source or that test signals be applied. Instead, ground-current sensors are installed in manholes or at other selected locations along cable run. When fault occurs, sensors transmit information about fault location to control center. Repair crew can be sent to location and cable can be returned to service with minimum of downtime.

B79-10025
CLOUD-TO-GROUND LIGHTNING DETECTOR
C. L. LENNON
Aug. 1979
KSC-11099 **Vol. 4, No. 1, p. 28**
Device senses electric-field changes and hf radiation to distinguish cloud-to-ground flashes from cloud-to-cloud flashes.

B79-10026
RELIABLE INVERTER SYSTEMS
S. NAGANO
Aug. 1979
NPO-14163 **Vol. 4, No. 1, p. 29**
Base driver with common-load-current feedback protects paralleled inverter systems from open or short circuits. Circuit eliminates total system oscillation that can occur in conventional inverters because of open circuit in primary transformer winding. Common feedback signal produced by functioning modules forces operating frequency of failed module to coincide with clock drive so module resumes normal operating frequency in spite of open circuit.

B79-10027
MONITORING DISASTER AREAS VIA SATELLITES
W. E. SIVERTSON, JR.
Aug. 1979
LANGLEY-12344 **Vol. 4, No. 1, p. 30**
Easily-displayed low-cost radar targets signal distress to orbiting satellites. Effective medical and evacuation efforts can be carried out successfully around globe due to this early warning. Another application is to measure rainfall, surface runoff, evaporation, and soil moisture.

B79-10028
SIMPLER CABLING AND POWER LINK FOR REMOTE READOUTS
J. C. PERRY
Aug. 1979
GSFC-12411 **Vol. 4, No. 1, p. 30**
Display power and segment data are multiplexed over same coaxial line. Thus, only one wire and return lead are needed, and single power supply at central location can service all remote displays.

B79-10029
A CLOSED-LOOP CONTROL-LOADING SYSTEM
B. R. ASHWORTH and R. V. PARRISH
Aug. 1979 See also NASA-TN-D-8371(N77-16020)
LANGLEY-12167 **Vol. 4, No. 1, p. 32**
Langley Differential Maneuvering Simulator (DMS) realistically simulates two aircraft operating in differential mode. It consists of two identical fixed-base cockpits and dome projection systems. Each projection system consists of sky/Earth projector and target-image generator and projector. Although programmable control forces are small part of overall system, they play large role in providing pilot with kinesthetic cues.

B79-10030
A TELEPHONE MULTILINE SIGNALING SYSTEM
P. C. TOOLE, J. L. BELT (Planning Research Corp.), R. GOODLOE (Planning Research Corp.), and D. B. LEINIGER (Planning Research Corp.)
Aug. 1979
KSC-11023 **Vol. 4, No. 1, p. 33**
Telephone system interconnects users of from one to eight telephone lines in network. System is useful in coordinating activities in large plants and installations. It permits spontaneous conferences, paging, and monitoring from key locations.

B79-10031
FADER AND RAMP SHAPER REPLACE LINEAR FILTERS
T. A. ROBINSON (Honeywell, Inc.)
Aug. 1979
MSC-16115 **Vol. 4, No. 1, p. 34**
Digital 'fader' or 'ramp shaper' circuits replace linear filters in suppressing switching transients and instabilities within servocontrol systems. Circuits can be optimized to introduce no attenuation, transport delay, or phase lags in new output signal.

B79-10032
OPTICAL MEMORIES IN DIGITAL COMPUTING
C. O. ALFORD (Georgia Institute of Technology) and T. K. GAYLORD (Georgia Institute of Technology)
Aug. 1979
M-FS-23897 **Vol. 4, No. 1, p. 35**
High capacity optical memories with relatively-high data-transfer rate and multiport simultaneous access capability may serve as basis for new computer architectures. Several computer structures that might profitably use memories are: a) simultaneous record-access system, b) simultaneously-shared memory computer system, and c) parallel digital processing structure.

B79-10166
TELETYPE TEST UNIT
R. H. COUCH and H. C. BEALL (Research Triangle Inst.)
Dec. 1979
LANGLEY-12527 **Vol. 4, No. 2, p. 181**
Device may be used to facilitate testing and fault isolation in teletype and modem systems that are used for communication by people who having hearing disabilities. Unit uses CMOS digital integrated circuitry which may be operated from relatively inexpensive battery of any voltage from 3 to 18 volts.

B79-10167
LIMITED SCAN DUAL-BAND HIGH-GAIN ANTENNA
P. W. CRAMER, JR. (Caltech) and K. E. WOO (Caltech)
Dec. 1979
NPO-14038 **Vol. 4, No. 2, p. 182**
Dual band communication and tracking antenna concept combines S- and X-band high gain performance in near field cassagrainian configuration. Design incorporating subreflector in near field of feed permits limited electronic scanning with phased array feed of approximately subreflector size placed in region between subreflector and main reflector.

B79-10168
DUAL HYBRID MODE FEED HORN
D. A. BATHKER (Caltech) and R. F. THOMAS (Caltech)
Dec. 1979
NPO-13594 **Vol. 4, No. 2, p. 183**
Antenna feed horn is combination of corrugated, round, and tapered waveguide configurations that are dimensioned to excite He sub 11 and He sub 12 modes to illuminate reflector antenna more uniformly than antenna horns excited only in He sub 11 mode. Horn is adaptable to both symmetrical and asymmetrical Cassagrainian antennas.

B79-10169
WIDE-BEAM FLUSH-MOUNTED ANTENNA
H. ELLIS, JR. (Rockwell Intern. Corp.)
Dec. 1979
MSC-16800 **Vol. 4, No. 2, p. 184**
Compact six-element S-band phased-array antenna produces exceptionally broad, circularly polarized beam and wide bandwidth. Suitable for flush mounting, antenna may be useful in high altitude aircraft, communication satellites, and ground-based moving vehicles.

B79-10170
HIGHER GAIN FOR FEEDBACK CONTROL SUBJECT TO VIBRATIONS
J. F. GARREN, JR. and F. R. NIESSEN
Dec. 1979 See also NASA-TM-X-74004 (N77-17103)
LANGLEY-12215 **Vol. 4, No. 2, p. 185**

Complementary filtering and simple electronic model greatly increase amount of useful gain achievable in feedback control system subjected to environmental vibration. Technique has increased useful gain from 2 to 4 and increased bandwidth from less than 0.5 Hz to over 1 Hz.

B79-10171
FAULT-TOLERANT COMPUTER SYSTEM
A. A. AVIZIENIS (Caltech), D. A. RENNELS (Caltech), and M. ERCEGOVAC (Caltech)
Dec. 1979
NPO-14562 **Vol. 4, No. 2, p. 186**

More reliable computers could be assembled by connecting four proposed VSLI 'building block' circuits with built-in error detection to standard microprocessors and memory devices to form self checking computer module. Each building block detects its own malfunctions and single bit errors found in memory.

B79-10172
MAXIMUM-LIKELIHOOD DATA DECODER
M. E. ALBERDA (Caltech)
Dec. 1979
NPO-13574 **Vol. 4, No. 2, p. 188**

Digital convolutional decoder circuit for data communication receiver employs Viterbi decoding algorithm to quickly and efficiently decode data on basis of 'maximum likelihood' computations.

B79-10173
MICROPROCESSOR-BASED INTERFACE FOR OCEANOGRAPHY
G. R. HANSEN (Caltech)
Dec. 1979
NPO-14566 **Vol. 4, No. 2, p. 189**

Ocean floor imaging system incorporates five identical microprocessor-based interface units, each assigned to specific sonar instrument to simplify system. Central control module based on same microprocessor eliminates need for custom tailoring hardware interfaces for each instrument.

B79-10174
GUIDANCE SYSTEM FOR A ROVING VEHICLE
J. A. MILLER (Caltech)
Dec. 1979 See also B78-10026
NPO-14376 **Vol. 4, No. 2, p. 190**

Computer controlled guidance system for semiautonomous robot guides robot in incompletely defined environment. System operates in real time avoiding obstacles detected by 'stereo television and laser range finder eyes.'

B79-10175
MULTIPLE-CAMERA AUTOMATIC CONTROLLER
E. T. BLOAM
Dec. 1979
LEWIS-12711 **Vol. 4, No. 2, p. 192**

Device automatically controls exposure time and frame sequencing for three remotely located cameras used for photographing interior of internal-combustion chamber through special viewing ports. Controller is highly applicable in many areas where closely monitored remote photography is required.

B79-10176
NAVIGATION-AID POWER SYSTEMS
G. L. GOLTZ (Caltech), L. M. KAISER (Caltech), and H. WEINER (Caltech)
Dec. 1979
NPO-14466 **Vol. 4, No. 2, p. 193**

Design synthesis and performance analysis (DSPA) program package is collection of subroutines used for computation of design and performance characteristics of viable solar-array-charged battery powered system for flashing-lamp buoys employed as maritime aids to navigation.

B79-10316
VIDEO-COMPRESSION SCHEME
H. LUM, JR. and Y. MATSUMOTO
Apr. 1980
ARC-10984 **Vol. 4, No. 3, p. 341**

Video compression circuit divides picture into elements transmitted at reduced data rate. By sampling elements along diagonals in N-by-N picture blocks, system gives picture quality comparable to that of standard television and superior to most pseudorandom sampling schemes.

B79-10317
ANALOG ACTUATOR-PISTON MEMORY
B. A. SABLE (United Technologies Corp.)
Apr. 1980
MSC-12697 **Vol. 4, No. 3, p. 342**

Simple analog control system of digitally controlled acuator uses 'stopped' position of actuator as 'memory' and potentiometer as sensing element during power failure to reload drive circuit to value equal to its last position preceding power loss.

B79-10318
MICROPROCESSOR-CONTROLLED RECEIVER
T. L. GRANT and Y. MATSUMOTO
Apr. 1980
ARC-11275 **Vol. 4, No. 3, p. 342**

Microprocessor and radio receiver are combined in low-cost, high performance, data communications receiver. Hybrid receiver automatically acquires and tracks UHF channels despite low signal-to-noise ratios, fading signal strengths, and high Doppler offset. It also performs digital bit synchronization, which has traditionally required separate unit.

B79-10319
CENTERING IMAGES IN SPLIT-SCREEN TV DISPLAY
J. B. HOPKINS (Westinghouse Elec. Corp.)
Apr. 1980
MSC-18399 **Vol. 4, No. 3, p. 343**

Circuit for creating 'split screen' television pictures allows operator to select any portion of each image to be displayed without moving cameras.

B79-10320
ALL-DIGITAL QPSK MODULATOR
R. W. BURGESS (Hughes Aircraft Co.) and R. L. JULIAN (Hughes Aircraft Co.)
Apr. 1980
MSC-16922 **Vol. 4, No. 3, p. 344**

Circuit consisting of only four components (2 IC chips and 2 time delay devices) modulates RF signal with 2 asynchronous digital data signals. Digital modulator is virtually free of amplitude modulation, is not subject to temperature effects from other components, dissipates less power, and is far simpler than its analog predecessors.

B79-10321
LOW-PROFILE COMMUNICATIONS ANTENNA
I. P. YU (Lockheed Electronics Co.)
Apr. 1980
MSC-16683 **Vol. 4, No. 3, p. 345**

Low profile antenna constructed using microstrip techniques are used for elliptical or circularly polarized signals. Operating range is determined by thickness of dielectric layer and size of antenna element. Compact size and shape along with other desirable features may make antenna useful for communication on trains and other road vehicles.

B79-10322
DUAL-FREQUENCY MICROWAVE ANTENNA
D. A. BATHKER (Caltech), S. A. BRUNSTEIN (Caltech), A. C. LUDWIG (Caltech), and P. D. POTTER (Caltech)
Apr. 1980 See also B79-10021; B79-10002
NPO-13091 **Vol. 4, No. 3, p. 346**

Single antenna using two feed horns (one for receiving and radiation X-band signals, and one for S-band signals), in conjunction with ellipsoid reflector and dichronic plate, can accommodate two different frequencies simultaneously.

B79-10323
INTERFEROMETER ANTENNA-ARRAY SYSTEM
J. A. KAISER, JR.
Apr. 1980
GSFC-12365 **Vol. 4, No. 3, p. 346**

System immune from interference locates signals in space without ambiguity. Signals from each antenna element are processed through three different mixing stages.

B79-10324
LOCK DETECTOR FOR NOISE-CODED SIGNALS
L. M. CARSON (Motorola, Inc.)
Apr. 1980
NPO-14435 **Vol. 4, No. 3, p. 348**

Circuit indicates when receiver is locked on pseudorandom-noise-coded signal. Circuit is used for reception of such digitally coded signals as scrambled voice messages or scrambled video. Circuit determines when receiver generated code is correct and synchronized with incoming signal so that receiver can track signal.

B79-10476
VARIABLE-RESOLUTION FACSIMILE SYSTEM
P. C. LIPOMA (Lockheed Electronics Co., Inc.)
Jun. 1980
MSC-18516 **Vol. 4, No. 4, p. 481**

Variable-element scanner in facsimile transmission system allows adjustment of resolution as dictated by document requirement. Device reduces transmission time when high resolution is not needed.

B79-10477
CONSERVING POWER IN COMPUTER MEMORIES
Innovator not given (Honeywell, Inc.) Jun. 1980
LANGLEY-11952 **Vol. 4, No. 4, p. 482**

Power control system for electronic memories saves energy by switching off power to portions of memories that are not in use. Although power-off period lasts only a few microseconds or milliseconds, it amounts to sizable part of overall read/write cycle timer; large energy savings can be realized.

B79-10478
DIGITAL GENERATION OF COMMAND-ENCODER WAVE-FORMS
W. S. ATARAS (General Electric Co.)
Jun. 1980
GSFC-12203 **Vol. 4, No. 4, p. 482**

Command encoder for command data system produces sinusoidal signals by purely digital means.

B79-10479
BINARY SYNCHRONOUS SIMULATOR
J. R. ROGERS, III
Jun. 1980
KSC-11096 **Vol. 4, No. 4, p. 483**

Flexible simulator for trouble-shooting data transmission system uses binary synchronous communications protocol to produce error-free transmission of data between two points. Protocol may be used to replace display generator or be directly fed to display generator.

B79-10480
SWITCHING REDUCES COMPUTER POWER REQUIREMENT
Innovator not given (Honeywell, Inc.) Jun. 1980
LANGLEY-11958 **Vol. 4, No. 4, p. 484**

Network of power switches activates only selected TTL circuits necessary for that particular time interval. Power that was fed to inactive circuits and dissipated is no longer applied. Because of this, system can use much higher, smaller power source.

03 PHYSICAL SCIENCES

B79-10033
SOLAR-POWERED PUMP
Innovator not given (Calmac Manufacturing Co.) Aug. 1979
M-FS-23996 **Vol. 4, No. 1, p. 39**

Collector pump of solar-heating systems is powered by concentrating solar collector separate from main collector. Solar driven pump eliminates need for electrical supplies to integral components.

B79-10034
TRANSPARENT SOLAR CELL MODULE
G. J. ANTONIDES (Lockheed Missiles and Space Co.), P. A. DILLARD (Lockheed Missiles and Space Co.), W. M. FRITZ (Lockheed Missiles and Space Co.), and D. P. LOTT (Lockheed Missiles and Space Co.)
Aug. 1979
NPO-14304 **Vol. 4, No. 1, p. 40**

Modified solar cell module uses high transmission glass and adhesives, and heat dissipation to boost power per unit area by 25% (9.84% efficiency based on cell area at 60 C and 100 mW/sq cm flux). Design is suited for automatic production and is potentially more cost effective.

B79-10035
SOLAR POWER CONDITIONER
L. JAN, N. JOHNSON, S. LINDENA, W. T. MCLYMAN, and J. N. SOLARIO
Aug. 1979
NPO-14356 **Vol. 4, No. 1, p. 41**

Efficient power-conditioning circuit designed to utilize maximum power available from solar cell array, controls output of array so that excess energy not needed by load is diverted to charge batteries for reserve power when sufficient sunlight is not available.

B79-10036
SUN TRACKER FOR CLEAR OR CLOUDY WEATHER
D. R. SCOTT and P. R. WHITE
Aug. 1979 See also NPO-13652 (B78-10186)
M-FS-23999 **Vol. 4, No. 1, p. 42**

Sun tracker orients solar collector so that they absorb maximum possible sunlight without being fooled by bright clouds, holes in cloud cover, or other atmospheric conditions. Tracker follows sun within 0.25 deg arc and is accurate within + or - 5 deg when sun is hidden.

B79-10037
ASSEMBLING SOLAR-CELL ARRAYS
J. T. BLOCH (Boeing Co.), R. T. HANGER (Boeing Co.), and F. W. NICHOLS (Boeing Co.)
Aug. 1979
NPO-14416 **Vol. 4, No. 1, p. 43**

Modified 70 mm movie film editor automtically attaches solar cells to flexible film substrate. Machine can rapidly and inexpensively assemble cells for solar panels at rate of 250 cells per minute. Further development is expected to boost production rate to 1000 cells per minute.

B79-10038
VARIABLE-SHAPE SOLAR-ENERGY CONCENTRATOR
C. G. MILLER (California Polytechnic State Univ. of San Luis Obispo, Calif.) and J. H. PHOL (California Polytechnic State Univ. of San Luis Obispo, Calif.)
Aug. 1979
NPO-13736 **Vol. 4, No. 1, p. 43**

Proposed low cost three dimensional tracking solar concentrator fabricated from lightweight, flexible polymeric film membrane is controlled in shape by differential pressure loading. Fine adjustments to shape could be made by mounting electrets or magnets on membrane or applying electric or magnetic field.

B79-10039
ALL-ELECTRIC GAS DETECTOR
J. S. MARGOLIS
Aug. 1979
NPO-14341 **Vol. 4, No. 1, p. 45**

Modified optoacoustic gas detector identifies gases by measuring pressure-induced voltage charge in electric signals. It can detect water vapor, atmospheric fluorocarbons, or certain nitrous or nitric compounds that indicate presence of explosives.

B79-10040
LOW-NOISE SPECTROPHONE
M. J. KAVAYA and J. S. MARGOLIS
Aug. 1979
NPO-14362 **Vol. 4, No. 1, p. 46**

Spectrophone, using continuous laser beam, operates at lower noise levels and thus detects trace amounts of gases with greater sensitivity.

B79-10041
IMPROVED COAL-SLURRY PIPELINE
W. L. DOWLER
Aug. 1979
NPO-14425 **Vol. 4, No. 1, p. 47**

High strength steel pipeline carries hot mixture of powdered coal and coal derived oil to electric-power-generating station. Slurry is processed along way to remove sulfur, ash, and nitrogen and to recycle part of oil. System eliminates hazards and limitations associated with anticipated coal/water-slurry pipelines.

B79-10042
FUEL GAS FROM BIODIGESTION
R. C. MCDONALD (National Space Tech. Laboratory) and B. C. WOLVERTON (National Space Tech. Laboratory)
Aug. 1979
M-FS-23957 **Vol. 4, No. 1, p. 48**

Biodigestion apparatus produces fuel gas (primarily methane) for domestic consumption, by anaerobic bacterial digestion of organic matter such as aquatic vegetation. System includes 3,786-1 cylindrical container, mechanical agitator, and simple safe gas collector for short term storage.

B79-10043
OPTICALLY COUPLING TUNABLE DIODE LASERS
D. M. ROBINSON and C. W. ROWLAND
Aug. 1979
LANGLEY-12438 **Vol. 4, No. 1, p. 49**

Proposed optical coupling, using lenses and mirrors that replace complex mechanical systems, can combine separate tunable diode laser outputs and expand wavelength range. Method uses single cooler housing and requires no moving parts within cooler assembly.

B79-10044
IMPROVED FLIGHT-SIMULATOR VIEWING LENS
W. M. KAHLBAUM
Aug. 1979 See also NASA-TP-1066 (N78-12829)
LANGLEY-12251 **Vol. 4, No. 1, p. 50**

Triplet lens system uses two acrylic plastic double convex lenses and one polystyrene plastic single convex lens to reduce chromatic distortion and lateral aberation, especially at large field angles within in-line systems of flight simulators.

B79-10045
PROJECTION OPTICS FOR A LASER VELOCIMETER
D. B. RHODES
Aug. 1979
LANGLEY-12328 **Vol. 4, No. 1, p. 51**

Projection optics for laser velocimeter (LV) scans constant focal volume over entire focus-position range. Optics thus simplify LV measurements over large flow fields (such as those encountered in wind tunnels) by eliminating calibrations required when focal volume varies with position.

B79-10046
A CHEVRON BEAM-SPLITTER INTERFEROMETER
J. B. BRECKINRIDGE
Aug. 1979
NPO-14502 **Vol. 4, No. 1, p. 51**

Fully tilt compensated double-pass chevron beam splitter, that removes channelling effects and permits optical phase tuning, is wavelength independent and allows small errors in alignment that are not tolerated in Michelson, Machzender, or Sagnac interferometers. Device is very useful in experiments where background vibration affects conventional interferometers.

B79-10047
OPTICAL SYSTEM FOR MULTISPECTRAL SCANNER
R. C. STOKES and N. G. KOCH (Lockheed Electronics Co.)
Aug. 1979
MSC-18255 **Vol. 4, No. 1, p. 52**

Optical system designed for scanning eight spectra bands simultaneously from aircraft at variety of speeds and altitudes is compact, easy to align, and reliable. System efficiently and effectively circumvents many problems associated with previous systems.

B79-10048
MARINE CHLOROPHYLL A ANALYSIS
R. W. JOHNSON
Aug. 1979 See also NASA-TP-1021 (N78-13628)
LANGLEY-12293 **Vol. 4, No. 1, p. 54**

Quantitative distribution maps of chlorophyll a and other important environmental parameters of coastal zones are prepared by regression analysis of sea-truth data and data collected by aircraft multispectral scanners.

B79-10049
PRODUCTION OF LARGE-AREA ELECTRETS
P. K. C. PILLAI, E. SHIVERS, and O. WEAVER
Aug. 1979
M-FS-23186 **Vol. 4, No. 1, p. 55**

Charge injection techniques are used in two methods of producing low cost homocharged electrets.

B79-10050
THEORY OF BACK-SURFACE-FIELD SOLAR CELLS
O. VONROOS
Aug. 1979
NPO-14451 **Vol. 4, No. 1, p. 57**

Report describes simple concise theory of back-surface-field (BSF) solar cells (npp + junctions) based on Shockley's depletion-layer approximation and cites superiority of two-junction devices over conventional unijunction cells.

B79-10051
RANKINE-CYCLE SOLAR-COOLING SYSTEMS
H. M. WEATHERS
Aug. 1979
M-FS-25094 **Vol. 4, No. 1, p. 57**

Report reviews progress made by three contractors to Marshall Space Flight Center and Department of Energy in developing Rankine-cycle machines for solar cooling and testing of commercially available equipment involved.

B79-10052
RANKINE-CYCLE HEATING AND COOLING SYSTEMS
Innovator not given (AiResearch Manufacturing Co.) Aug. 1979
M-FS-23998 **Vol. 4, No. 1, p. 58**

Design for domestic or commercial solar heating and cooling system based on Rankine heat pump cycle includes detailed drawings, performance data, equipment specifications, and other pertinent information.

B79-10053
DESIGN INFORMATION FOR SOLAR-HEATING SYSTEMS
Innovator not given (Colt, Inc.) Aug. 1979
M-FS-25097 **Vol. 4, No. 1, p. 58**

Report contains preliminary design information for two solar-heating and hot water systems presently under development. Information includes quality control data, special tooling specifica-

tions, hazard analysis, and preliminary training program for installation contractors.

B79-10054
SOLAR-HEATING SYSTEM-PERFORMANCE TESTS
Innovator not given (IBM Federal Systems Div.) Aug. 1979 See also M-FS-25022 (B78-10494)
M-FS-25116 **Vol. 4, No. 1, p. 58**
Report describes comprehensive performance tests of complete solar powered space and hot water heating system to verify its suitability for field installation in small single family dwellings.

B79-10055
PERFORMANCE TEST FOR A SOLAR WATER HEATER
Innovator not given (Wyle Labs., Inc.) Aug. 1979
M-FS-25114 **Vol. 4, No. 1, p. 59**
Two reports describe procedures and results of performance tests on domestic solar powered hot water system. Performance tests determine amount of energy collected by system, amount of energy delivered to solar source, power required to operate system and maintain proper tank temperature, overall system efficiency, and temperature distribution in tank.

B79-10056
AIR SOLAR COLLECTOR-INSTALLATION PACKAGE
Innovator not given (Owens-Illinois, Inc.) Aug. 1979
M-FS-25031 **Vol. 4, No. 1, p. 59**
Installation package for air solar collector contains parts list, operating instructions, and performance specifications.

B79-10057
STATIC LOAD TESTING OF A LIQUID SOLAR COLLECTOR
Innovator not given (Wyle Labs., Inc.) Aug. 1979 See also M-FS-23890 (B78-10208)
M-FS-25115 **Vol. 4, No. 1, p. 59**
Report summarizes results of tests in which flat-plate liquid solar collectors were subjected to static pressure loads and examined for leakage and other damage.

B79-10058
LIQUID SOLAR COLLECTOR-PERFORMANCE EVALUATION
Innovator not given (Wyle Labs., Inc.) Aug. 1979 See also M-FS-25010 (B78-10498); M-FS-25082 (B78-10499)
M-FS-25090 **Vol. 4, No. 1, p. 59**
Report summarizes thermal performance tests and measurements of incident-of-angle modified and transient response of flat-plate solar collector.

B79-10059
WEATHERING OF A LIQUID-FILLED SOLAR COLLECTOR
Innovator not given (Wyle Labs., Inc.) Aug. 1979 See also M-FS-23972 (B78-10477)
M-FS-25113 **Vol. 4, No. 1, p. 60**
Report describes procedures and results of tests for effects of weathering on flat-plate liquid solar collector. Thermal performance was measured before and after natural weathering for 15-1/2 months by using Marshall Space Flight solar simulator.

B79-10060
DESIGN OF A CONCENTRATING SOLAR COLLECTOR
Innovator not given (Northrop, Inc.) Aug. 1979
M-FS-25098 **Vol. 4, No. 1, p. 60**
Design package for concentrating solar collector includes detailed set of design drawings and parts list for all components and subcomponents of system (including its tracking drive).

B79-10061
CONCENTRATING SOLAR COLLECTOR-PERFORMANCE TESTS
Innovator not given (Wyle Labs., Inc.) Aug. 1979 See also M-FS-25068 (B78-10500)
M-FS-25086 **Vol. 4, No. 1, p. 60**
Report summarizes test results from evaluation of concentrating solar collector thermal performance, from transient behavior, and incident-of-angle behavior. Tests were conducted using National Bureau of Standards recommedations and specifications.

B79-10062
CONTROLLER FOR SOLAR HEATING-DESIGN PACKAGE
Innovator not given (Solar Control Corp.) Aug. 1979
M-FS-25009 **Vol. 4, No. 1, p. 61**
Report contains performance specifications and detailed drawings for two instruments: (1) differential controller, and (2) temperature monitor, for solar-powered water-heating systems. Included in package are schematics, wiring diagrams, test procedures, and parts list.

B79-10063
COST ANALYSIS OF HOT-AIR SOLAR-HEATING SYSTEMS
B. J. HAWKINS and R. D. STEWART
Aug. 1979
M-FS-25092 **Vol. 4, No. 1, p. 61**
Report describes results of study of two operational test sites (Huntsville, Alabama and Carlsbad, New Mexico) furnishing estimates of actual costs and potential cost savings of new and retrofit hot-air solar heating and hot-water system for single family dwellings.

B79-10064
SOLAR ENERGY FOR INDUSTRIAL PROCESS HEAT
R. H. BARBIERI and D. L. PIVIROTTO
Aug. 1979
NPO-14498 **Vol. 4, No. 1, p. 62**
Findings of study of potential use for solar energy utilization by California dairy industry prove that applicable solar energy systems furnish much of heat needed for milk processing with large savings in expenditures for oil and gas and ensurance of adequate readily available sources of process heat.

B79-10065
AN ANNOTATED ENERGY BIBLIOGRAPHY
S. J. BLOW
Aug. 1979 See also NASA-TM-74764 (N77-28578); NASA-TM-47465 (N77-28577)
LANGLEY-12488 **Vol. 4, No. 1, p. 62**
Comprehensive annotated compilation of books, journals, periodicals, and reports on energy and energy related topics, contains approximately 10,0000 technical and nontechnical references from bibliographic and other sources dated January 1975 through May 1977.

B79-10066
ANALYSIS OF APERTURE ANTENNA RADIATION PATTERN
R. HERSKIND (AVCO Corp.), E. SAYRE (AVCO Corp.), J. E. TROUSDALE (AVCO Corp.), and J. YOS (AVCO Corp.)
Aug. 1979
MSC-16246 **Vol. 4, No. 1, p. 63**
Report presents analysis of radiation pattern produced by aperture antenna transmitting through layered dielectric material. Report also describes computer program developed to compute radiation patterns on basis of analysis.

B79-10067
ANALYSIS OF BUILDING HEATING AND COOLING
V. W. CHAI, S. HIGGINS, F. L. LANSING, F. W. STOLLER, and D. M. STRAIN
Aug. 1979
NPO-14683 **Vol. 4, No. 1, p. 63**
Energy Conservation Program (ECP) gives design engineer methodology and easy-to-use computer program for simulating hourly thermal characteristics over full year for individually characterized zones within building. Inexpensive system can be used to develop thermal model of building to aid selection of most suitable and economical heating and cooling system for building.

B79-10177
SINGLE-AXLE, DOUBLE-AXIS SOLAR TRACKER
L. W. BRANTLEY and B. D. LAWSON

Dec. 1979
M-FS-23267 **Vol. 4, No. 2, p. 197**
Solar concentrator tracking mechanism consisting of angular axle and two synchronized drive motors, follows seasonal as well as diurnal changes in Earth's orientation with respect to incoming sunlight.

B79-10178
HIGH-PERFORMANCE SOLAR COLLECTOR
D. C. BEEKLEY (Owens-Illinois, Inc.) and G. R. MATHER, JR. (Owens-Illinois, Inc.)
Dec. 1979
M-FS-25135 **Vol. 4, No. 2, p. 198**
Evacuated all-glass concentric tube collector using air or liquid transfer mediums is very efficient at high temperatures. Collector can directly drive existing heating systems that are presently driven by fossil fuel with relative ease of conversion and less expense than installation of complete solar heating systems.

B79-10179
SIMPLE, ECONOMICAL SOLAR COLLECTOR
K. ANTHONY
Dec. 1979 See also B78-10203
M-FS-25109 **Vol. 4, No. 2, p. 199**
Hot air solar collector designed for economy and simplicity is assembled from only three parts: (1) molded urethane foam body, (2) flat sheet metal collector panel and (3) transparent cover. Large arrays may be assembled by inserting male fittings of each collector into female fitting of adjacent collector.

B79-10180
LIGHTWEIGHT, ECONOMICAL SOLAR CONCENTRATOR
J. G. SIMPSON
Dec. 1979
M-FS-23727 **Vol. 4, No. 2, p. 200**
Concentrator consisting of aluminized polymeric film stretched over parallel tensioned wires that can be used with or without tracking drive promises to reduce cost of commercial and residential solar heating systems.

B79-10181
POINTING ERRORS IN SOLAR DISH COLLECTORS
R. O. HUGHES (Caltech)
Dec. 1979
NPO-14630 **Vol. 4, No. 2, p. 200**
Mathematical analysis calculates effects of transient pointing errors in solar dish collectors treating each pointing error separately. This approach considerably simplifies programming of simulation models for tracking drive, wind effects, and other design parameters.

B79-10182
DIFFERENTIAL SPECTROPHONE
J. S. MARGOLIS (Caltech)
Dec. 1979 See also B78-10167; B79-10040
NPO-14599 **Vol. 4, No. 2, p. 202**
Sensitivity and measuring capability of optoacoustic gas analyzer (spectrophone) are enhanced by combining differential monitoring stark modulation.

B79-10183
LENS WINDOW SIMPLIFIES TDL HOUSING
D. M. ROBINSON and C. W. ROWLAND
Dec. 1979
LANGLEY-12437 **Vol. 4, No. 2, p. 203**
Lens window seal in tunable-diode-laser housing replaces plan parallel window. Lens seals housing and acts as optical-output coupler, thus eliminating need for additional reimaging or collimating optics.

B79-10184
FOCUSING LASER SCANNER
W. R. CALLEN (Georgia Inst. of Technology) and J. E. WEAVER (Georgia Inst. of Technology)
Dec. 1979 See also NASA-CR-150810 (N78-31412)
M-FS-25102 **Vol. 4, No. 2, p. 204**
Economical laser scanner assembled from commercially available components, modulates and scans focused laser beam over area up to 5.1 by 5.1 cm. Scanner gives resolution comparable to that of conventional television. Device is highly applicable to area of analog and digital storage and retrieval.

B79-10185
MULTIPLEXED MASS SPECTROMETER FOR DESORPTION STUDIES
M. BALES (California Univ., Berkeley)
Dec. 1979
ARC-11134 **Vol. 4, No. 2, p. 205**
Microprocessor controlled mass spectrometer data acquisition system simultaneously monitors up to nine gaseous products emitted from heated substrate during thermal desorption experiments.

B79-10186
PREIONIZED DISCHARGE FOR SHORT-WAVELENGTH LASER
J. B. LAUDENSLAGER (Caltech) and T. J. PACALA (Caltech)
Dec. 1979 See also B75-10115
NPO-13945 **Vol. 4, No. 2, p. 206**
Laser uses helium and nitrogen gases at pressure of several atmospheres to produce emissions in visable and ultraviolet regions. Preionization of gases by transverse discharge insures that main discharge is glow instead of arc for proper charge transfer mechanism.

B79-10187
IMPROVED TIME-OF-FLIGHT MASS SPECTROMETER
K. A. LINCOLN
Dec. 1979
ARC-11090 **Vol. 4, No. 2, p. 207**
External signal-conditioning electronics assembled from commercially available components improves dynamic capability of time-of-flight mass spectrometer.

B79-10188
DEGASSING PROCEDURE FOR ULTRAHIGH VACUUM
B. C. MOORE (McDonnell Douglas Corp.)
Dec. 1979
M-FS-25103 **Vol. 4, No. 2, p. 208**
Calculations based on diffusion coefficients and degassing rates for stainless-steel vacuum chambers indicate that baking at lower temperatures for longer periods give lower ultimate pressures than rapid baking at high temperatures. Process could reduce pressures in chambers for particle accelerators, fusion reactors, material research, and other applications.

B79-10189
PERFORMANCE EVALUATION OF A LIQUID SOLAR COLLECTOR
Innovator not given (Wyle Laboratories) Dec. 1979
M-FS-25026 **Vol. 4, No. 2, p. 209**
Report describes thermal performance and structural-load tests on commercial single glazed flat-plate solar collector with gross area of 63.5 sq ft that uses water as heat-transfer medium. Report documents test instrumentation and procedures and presents data as tables and graphs. Results are analyzed by standard data-reduction methods.

B79-10190
DESIGN AND INSTALLATION OF A SOLAR-POWERED HOT-WATER SYSTEM
Innovator not given (Solar Engineering & Manufacturing Co.) Dec. 1979
M-FS-25080 **Vol. 4, No. 2, p. 209**
Package includes performance specifications, design drawings, hazard analysis, and installation for complete solar-powered hot-water system.

B79-10191
THE DESIGN OF SOLAR-HEATING SYSTEMS
Innovator not given (Honeywell, Inc.) Dec. 1979

M-FS-25108 **Vol. 4, No. 2, p. 209**

Report describes organized approach to design of solar-heating systems. Such parameters as collector area, storage capacity, hardware, and constraints are determined and complete cost-and-performance analysis are made. Report provides practical example by tracing development of several systems sized for single family, multifamily, and commercial buildings in Minneapolis area.

B79-10192
THE DESIGN OF SOLAR-HEATING AND COOLING SYSTEMS
Innovator not given (Honeywell, Inc.) Dec. 1979
M-FS-25106 **Vol. 4, No. 2, p. 210**

Methods described in report were used to develop specifications for Rankine-cycle solar heating and cooling systems for single family, multifamily, and commercial buildings.

B79-10193
DESIGN PACKAGE FOR A SOLAR-HEATING SYSTEM
Innovator not given (IBM Corp.) Dec. 1979 See also B78-10492; B78-10493
M-FS-25136 **Vol. 4, No. 2, p. 210**

Report contains sufficient information to assemble complete tested residential flat-plate solar heating system. Descriptive material provides design, performance, and hardware specifications for utilization by architectural engineers, and contractors in procurement, installation, operation, and maintenance of similar solar applications.

B79-10194
PERFORMANCE AFTER WEATHERING OF A LIQUID SOLAR COLLECTOR
Innovator not given (Wyle Laboratories) Dec. 1979 See also B78-10206
M-FS-25137 **Vol. 4, No. 2, p. 211**

Results from retesting of liquid solar collector described in 'Performance evaluation of liquid collector' (M-FS-23931), after long term exposure to natural weathering indicate no detectable degradation in collector performance and no visable deterioration in appearance of collector. Supporting data and pretest/post test efficiency comparison are included.

B79-10195
MODULAR SOLAR-HEATING SYSTEM - DESIGN PACKAGE
D. S. SINTON (IBM Corp.)
Dec. 1979 See also B78-10494
M-FS-25130 **Vol. 4, No. 2, p. 211**

Compilation contains design, performance, and hardware specifications in sufficient detail to fabricate or procure materials and install, operate, and maintain complete modular solar heating and hot water system for single family size dwellings.

B79-10196
CONCENTRIC-TUBE SOLAR COLLECTOR
Innovator not given (Owens-Illinois) Dec. 1979 See also B79-10056
M-FS-25133 **Vol. 4, No. 2, p. 211**

Brochure contains design, performance, and installation information for commercial concentric-tube solar collector.

B79-10197
PERFORMANCE VERIFICATION OF AN AIR SOLAR COLLECTOR
D. C. MILLER (Owens-Illinois) and R. F. ROMAKER (Owens-Illinois)
Dec. 1979 See also B79-10056
M-FS-25131 **Vol. 4, No. 2, p. 212**

Procedures and results of battery of qualification tests performed by independent certification agency on commercial solar collector are presented in report. Reported results were used as basis in judging collector suitable for field installation in residential and commerical buildings.

B79-10198
PRELIMINARY DESIGN OF AN AIR SOLAR COLLECTOR
Innovator not given (Owens-Illinois) Dec. 1979
M-FS-25138 **Vol. 4, No. 2, p. 212**

Report containing performance specifications and engineering drawings of concentric-tube air solar collector show details of collector and subcomponents that indicate efficiency surpassing predetermined performance baseline for air collectors.

B79-10199
DESIGN REVIEW OF A LIQUID SOLAR COLLECTOR
B. L. WIESEWMAIER
Dec. 1979
M-FS-25140 **Vol. 4, No. 2, p. 212**

Report documents procedures, results, and recommendations for in-depth analysis of problems with liquid-filled version of concentric-tube solar collector. Problems are related to loss of vacuum and/or violent fracture of collector elements, fluid leakage, freezing, flow anomalies, manifold damage, and other component failures.

B79-10200
DEVELOPMENT OF NONMETALLIC SOLAR COLLECTOR AND SOLAR-POWERED PUMP
J. C. PARKER
Dec. 1979 See also B78-10498; B78-10499; B79-10033
M-FS-25143 **Vol. 4, No. 2, p. 213**

Design and building of two unique components for solar heating 1. flatplate solar collector using no metal components, and 2. solar powered pump for heating and cooling systems are outlined in report. Report also discusses hardware, deliverable end items, problems encountered during fabrication and testing, and performance certification.

B79-10201
CERTIFICATION TESTS ON THE SOLAR-POWERED PUMP
Innovator not given (Calmac Manufacturing Co.) Dec. 1979 See also B79-10200
M-FS-25144 **Vol. 4, No. 2, p. 213**

Evaluation of solar-powered pump is given. Details cover fifty performance criterion along with summary of findings.

B79-10202
COST-REDUCTION ANALYSIS FOR A SOLAR-HEATING SYSTEM
W. L. REID (Alabama Univ.) and R. E. SHANNON (Alabama Univ.)
Dec. 1979 See also B79-10063
M-FS-25152 **Vol. 4, No. 2, p. 213**

Details on solar-heating system installed in Huntsville, Alabama are presented. Estimated cost savings and recommendations for system are proposed.

B79-10203
REMOTE-SENSING APPLICATIONS TO GEOLOGY
Innovator not given (University of Tennessee Space Institute) Dec. 1979
M-FS-25151 **Vol. 4, No. 2, p. 214**

Results of two day workshop on applications of remote sensing to geology are summarized in report. Topics discussed are environmental analysis, crop classification, plant epidemics and diseases, irrigation reform, and soil surveys.

B79-10204
COMPUTER ANALYSIS OF LANDSAT DATA
R. R. JAYROE, JR.
Dec. 1979 See also NASA-TM-78184 (N78-30634)
M-FS-25105 **Vol. 4, No. 2, p. 214**

Report summarizing possible ways of improving LANDSAT data provided by computers is presented.

B79-10205
SKYMAP STAR CATALOG
D. GOTLIEB (Computer Science Corp.)
Dec. 1979
GSFC-12445 **Vol. 4, No. 2, p. 215**

Skymap data and data-handling programs for 255,000 stars are discussed.Data should prove useful to astronomers, spacecraft

designers, and others who have need for comprehensive star catalog.

B79-10206
METEOROLOGICAL DATA-PROCESSING PACKAGE
J. B. BILLINGSLY and P. A. BRAKEN
Dec. 1979
GSFC-12372 **Vol. 4, No. 2, p. 215**
METPAK, meteorological data-processing package of satellite data used to develop cloud-tracking maps, is given. Data can develop and enhance numerical prediction models for mesoscale phenomena and improve ability to detect and predict storms.

B79-10207
AOIPS CLASSIFICATION PACKAGE
J. B. BILLINGSLY and P. A. BRAKEN
Dec. 1979
GSFC-12374 **Vol. 4, No. 2, p. 216**
CLASSPAK, interactive program for classifying multispectral data, is presented. Program is applicable in land-cover studies, forestry and agriculture investigations, and also for watershed studies.

B79-10325
TRANSMITTER/RECEIVER FOR LASER IMAGING
P. G. HASELL, JR. (Environmental Research Institute of Michigan), L. M. LARSEN (Environmental Research Institute of Michigan), and E. A. WORK (Bureau of Land Management)
Apr. 1980 See also NASA-CR-151461 (N77-27485)
MSC-18196 **Vol. 4, No. 3, p. 351**
Dual-mirror transmitter and receiver combination is used with laser multispectral imaging system carried by low fly aircraft. Device can be arranged to reduce laser light backscatter which creates false light levels in recorded image and compensates for scanning phase delay between transmitter and receiver.

B79-10326
FABRICATING WEDGE-SHAPED BEAM SPLITTERS
C. M. FLEETWOOD, JR. and S. H. RICE
Apr. 1980
GSFC-12348 **Vol. 4, No. 3, p. 352**
Fast economical fabrication produces wedge-shaped beam splitter with 0.3 micrometer edge, compared to conventional methods that have yielded 2 micrometer edges. Typical beam splitter made by new process is prism-shaped with right-triangle cross-section.

B79-10327
FIELD-FLATTENER LENS
F. VICIK (Barnes Engineering Co.)
Apr. 1980 See also NASA-CR-151753 (N78-29424)
MSC-18373 **Vol. 4, No. 3, p. 353**
Proposed spherical lens employs image flattening reflective surface within spherical refracting elements to focus light to flat image. Device is intended for use as optical scanner for silicon light detector. Lens can scan wide angle at low F-stops, producing high-resolution image over angle of wavelengths from 0.4 to 14 micrometers.

B79-10328
HIGH-RESOLUTION SPECTROMETER
R. BEER (Caltech)
Apr. 1980
NPO-14372 **Vol. 4, No. 3, p. 354**
Proposed spectrometer combines optical and imaging devices and cryogenic cooling to measure infrared radiation in 1-to-15 micrometer wavelength range with spatial resolution of 1 arc-second and average spectral resolution of about 0.1 cm(-1). Compact, lightweight unit is suitable for laboratory or field use. Pollution monitoring is possible application.

B79-10329
LIQUID/LIQUID HEAT EXCHANGER
C. G. MILLER (Caltech)
Apr. 1980
NPO-14271 **Vol. 4, No. 3, p. 355**
Conceptual design for heat exchanger, utilizing two immiscible liquids with dissimilar specific gravities in direct contact, is more efficient mechanism of heat transfer than conventional heat exchangers with walls or membranes. Concept could be adapted for collection of heat from solar or geothermal sources.

B79-10330
NO-REHEAT AIR-CONDITIONING
H. D. OBLER
Apr. 1980
GSFC-12191 **Vol. 4, No. 3, p. 356**
Air conditioning system, for environmentally controlled areas containing sensitive equipment, regulates temperature and humidity without wasteful and costly reheating. System blends outside air with return air as dictated by various sensors to ensure required humidity in cooled spaces (such as computer room).

B79-10331
IMPROVING MASER FREQUENCY STABILITY
S. B. CRAMPTON (Williams College)
Apr. 1980
GSFC-12400 **Vol. 4, No. 3, p. 357**
Hydrogen maser frequency standard is more stable by addition of parallel pyrex capillary tube array collimator. With collimator, maser line width has been made as narrow as 0.24 hertz representing fivefold improvement over maser without collimator. Fluorocarbon coating in tubes virtually eliminates energy loss in collimator.

B79-10332
ROTATABLE MICROSCOPE STAGE
J. A. IVANISKO (Sperry Rand Corp.)
Apr. 1980
MSC-18549 **Vol. 4, No. 3, p. 358**
Samples mounted on rotatable microscope stage consisting of aluminum hemisphere resting in hemispherical cavity of polytetrafluoroethylene base is viewed at various angles. Stage permits operator to orient sample at selected fixed angles.

B79-10333
MICROWAVE MEASUREMENT OF ATMOSPHERIC PRESSURE
D. A. FLOWER (Caltech) and G. E. PECKHAM (Heriot-Watt University)
Apr. 1980
NPO-14450 **Vol. 4, No. 3, p. 358**
Proposed concept for measuring surface air pressure over ocean utilizes three pairs of microwave signals transmitted from orbiting satellite. Measurements are used for long range weather forecasting.

B79-10334
ALL-GLASS SOLAR COLLECTOR
J. P. WISNEWSKI (PPG Industries, Inc.)
Apr. 1980
M-FS-23870 **Vol. 4, No. 3, p. 359**
Proposed all tempered glass solar collector uses black collection fluid and mirrored bottom to reduce energy loss and overall costs associated with conventional collectors. Collector is more efficient and practically maintenance-free.

B79-10335
SOLAR-HEATING SYSTEM DESIGN PACKAGE
Innovator not given (Contemporary Systems, Inc.) Apr. 1980
M-FS-25226 **Vol. 4, No. 3, p. 360**
Report describes solar heating system composed of warm-air solar collector, logic control unit, and switching and transport unit, that meets government standards for installation in residential dwellings. Text describes system operation and performance specifications complemented by comprehensive set of subcomponent design drawings.

B79-10336
TEST AND EVALUATION OF A SOLAR-HEATING SYSTEM

Innovator not given (Fern Engineering Co., Inc.) Apr. 1980
M-FS-25201 **Vol. 4, No. 3, p. 360**

Report documents results of evaluation tests performed on components of commerical solar heating and hot water system. Subsystems tested include flat plate solar collector, energy transport module, and control panel. Tests conducted include snow and wind loads, flame spread, and smoke classification as well as solar heating operation.

B79-10337
INSTALLATION PACKAGE FOR A SOLAR-HEATING SYSTEM
Innovator not given (Solaron Corp.) Apr. 1980
M-FS-25198 **Vol. 4, No. 3, p. 360**

Package consists of installation, operation and maintenance manuals for four commercial solar energy subsystems, including flat plate solar collector pebble bed thermal-storage. Manual gives design information, sizing data, specification drawings, and other material for subsystem.

B79-10338
VERIFICATION TESTS FOR A SOLAR-HEATING SYSTEM
Innovator not given (Colt, Inc.) Apr. 1980
M-FS-25178 **Vol. 4, No. 3, p. 361**

Report describes method of verification of solar space heating and hot-water systems using similarity comparison, mathematical analysis, inspections, and tests. Systems, subsystems, and components were tested for performance, durability, safety, and other factors. Tables and graphs complement test materials.

B79-10339
RESIDENTIAL SOLAR-HEATING/COOLING SYSTEM
Innovator not given (Energy Resources Center of Honeywell, Inc.) Apr. 1980 See also B79-10192
M-FS-25166 **Vol. 4, No. 3, p. 361**

Report documents progress of residential solar-heating and cooling system development program at 5-month mark of anticipated 17-month program. System design has been completed, and development and component testing has been initiated. Report includes diagrams, operation overview, optimization studies of subcomponents, and marketing plans for system.

B79-10340
INSTALLATION PACKAGE FOR A SOLAR-HEATING SYSTEM
Innovator not given (Solar Engineering and Equipment Co., Inc.) Apr. 1980
M-FS-25157 **Vol. 4, No. 3, p. 361**

Installation package for solar-powered hot-air system contains such information as operation and maintenance manuals, hardware brochures, schematics, operating mode descriptions, and drawings.

B79-10341
LIQUID SOLAR COLLECTOR
Innovator not given (Florida Solar Energy Center) Apr. 1980
M-FS-25218 **Vol. 4, No. 3, p. 362**

Report documents evaluation test on commercial flat-plate solar collector that uses water as working fluid. Performance was measured before and after 34-day exposure to natural environment. Tables in metric and English units present data on air and water temperatures, waterflow, insolation, efficiency, and windspeed and direction.

B79-10342
FINAL REPORT ON THE CONCENTRIC-TUBE SOLAR COLLECTOR
J. C. PARKER
Apr. 1980 See also B79-10178; B79-10199
M-FS-25188 **Vol. 4, No. 3, p. 362**

Report documents 26-month program to optimize performance of commercial high performance concentric tube solar collector. Report discusses program objectives, accomplishments, encountered problems, and final hardware. Certification test results are also included.

B79-10343
COLLECTOR PERFORMANCE AT VARIOUS AIR-CHANNEL DEPTHS
Innovator not given (Wyle Laboratories) Apr. 1980
M-FS-25159 **Vol. 4, No. 3, p. 362**

Report describes evaluation of solar collector efficiency which was measured at airflow channel depths of 3, 2, 1, and 1/2 inches in solar simulator. Data were also recorded on absorber surface temperature, inlet and outlet temperatures, airflow and insolation rates, collector differential pressure and windspeed, for result tabulation and plotting.

B79-10344
FIN-TUBE SOLAR COLLECTORS
Innovator not given (Wyle Laboratories) Apr. 1980
M-FS-25238 **Vol. 4, No. 3, p. 362**

Report presents test procedures and results of thermal-performance evaluation of seven commercial fin tube (liquid) solar collector-absorber plates. Tests were conducted indoors at Marshall Space Flight Center Solar simulator. Results are graphically shown along with supporting test data and summary, indicating efficiency as function of collector inlet temperature.

B79-10345
CERTIFICATION OF THE CONCENTRATING SOLAR COLLECTOR
Innovator not given (Northrup, Inc.) Apr. 1980
M-FS-25220 **Vol. 4, No. 3, p. 363**

Report describes procedures and results of extensive testing of concentrating solar collector performed for certification of systems compliance with government performance standards. Test includes operational, electrical, mechanical, and thermal checks, as well as structural integrity.

B79-10346
COLLECTOR PERFORMANCE AFTER WEATHERING
Innovator not given (Solar Energy Systems Div. of Wyle Laboratories) Apr. 1980 See also B78-10204
M-FS-25187 **Vol. 4, No. 3, p. 363**

Method drastically reduces preparation time of pentaerythritol diformal (2, 4, 8, 10-tetroxaspiro (5.5) undecane) from several hours to time span of 3 to 20 minutes with yields greater than 90 percent. Other advantages include elimination of solvents, decrease in labor and energy needs, adaptability to continuous operations, and overall simplicity and convenience.

B79-10347
CONCENTRATING SOLAR COLLECTOR - FINAL DESIGN
J. C. PARKER
Apr. 1980 See also B78-10500
M-FS-25186 **Vol. 4, No. 3, p. 363**

Final report of program to improve commercially available concentrating solar collector describes final hardware, discusses problems encountered, and presents certification statements, photographs, and recommendations for modification.

B79-10348
WEATHERING OF A FLAT-PLATE SOLAR COLLECTOR
Innovator not given (Wyle Laboratories) Apr. 1980
M-FS-25160 **Vol. 4, No. 3, p. 364**

Report contains performance evaluation of flat-plate liquid solar collector after 14-months of natural weathering. Collector efficiency was calculated and plotted as function of inlet liquid temperature. Measurements were made of ambient temperature, inlet and outlet temperatures, differential temperature and pressure, liquid flow rate, insolation, and windspeed.

B79-10349
GUIDE TO REMOTE-SENSOR DATA SYSTEMS
R. R. DEWITT (New Tech., Inc.) and J. L. ELLISON (New Tech., Inc.)
Apr. 1980 See also NASA-CR-150837 (N79-14499)
M-FS-25169 **Vol. 4, No. 3, p. 364**

Remote sensing data-handbook presents theoretical and practical information on spaceborne sensors and associated systems for Earth-resources applications. Handbook provides

discussion on historical information, principles of operations, factors affecting performances, nature of data output, and system required to process data and trends in research and development.

B79-10350
SOLAR INSOLATION MODEL
J. H. SMITH (Caltech)
Apr. 1980
NPO-14787 **Vol. 4, No. 3, p. 365**

Computer program SOLINS helps engineers with relatively complex task of choosing best orientation of fixed flat-plate solar collectors for local conditions. Program models average hourly solar insolation on fixed but arbitrarily-oriented surface. Consideration is given to problems of array spacing, shadowing, and use of augmentation reflectors to increase insolation at collector surface.

B79-10351
GENERAL OPTICS EVALUATION PROGRAM
B. J. HOWELL
Apr. 1980
GSFC-12439 **Vol. 4, No. 3, p. 365**

Computer program GENOPTICS is generalized aid for analysis and evaluation of optical systems that employ lenses, mirrors, diffraction gratings, and other geometrical optical surfaces. It can exactly trace up to 800 rays through as many as 40 surfaces. Results can be used to compute third order aberration coefficients including spheric contributions.

B79-10352
THERMODYNAMIC AND TRANSPORT PROPERTIES OF FLUIDS
T. E. FESSLER
Apr. 1980
LEWIS-13127 **Vol. 4, No. 3, p. 365**

Computer program subroutine FLUID calculates thermodynamic and transport properties of pure fluids in liquid, gas, or two-phase (liquid/gas) conditions. Program determines thermodynamic state from assigned values for temperature and density, pressure and density, temperature and pressure, pressure and entropy, or pressure and enthalpy.

B79-10481
NUCLEAR ELECTRO-OPTIC POWER
J. J. SINGH
Jun. 1980 See also NASA-TM-78789 (N78-33538)
LANGLEY-12496 **Vol. 4, No. 4, p. 487**

Tertiary-nuclear power cell utilizes alpha source from which radiated particles strike phosphors which in turn emit photons that are converted to electricity by solar cell. Experiments indicated that device is capable of providing sufficient power for numerous electronic applications where reliability and long life are important.

B79-10482
PROPOSED JOSEPHSON VOLTAGE STANDARD
C. C. CHANG (U.S. Dept. of Commerce), L. B. HOLDERMAN (U.S. Dept. of Commerce), and J. TOOTS (U.S. Dept. of Commerce)
Jun. 1980
M-FS-23845 **Vol. 4, No. 4, p. 488**

Relatively-simple microwave integrated circuit comprising two resonators linked by Josephson junction could be set up to generate standard Josephson volt in any industrial laboratory. Standard cells and electronic equipment could be readily compared and calibrated to this standard.

B79-10483
HIGH-EFFICIENCY WIND TURBINE
L. A. HEIN and W. N. MYERS
Jun. 1980
M-FS-23830 **Vol. 4, No. 4, p. 489**

Vertical axis wind turbine incorporates several unique features to extract more energy from wind increasing efficiency 20% over conventional propeller driven units. System also features devices that utilize solar energy or chimney effluents during periods of no wind.

B79-10484
INCREASED FUEL-CELL CROSS-PRESSURE LIMIT
W. F. BELL (United Technologies Corp.) and N. J. MAIO (United Technologies Corp.)
Jun. 1980
M-FS-25196 **Vol. 4, No. 4, p. 490**

Polytetrafluoroethylene (PTFE) impregnated support screen increases cross pressure on electrolyte-filled matrix in fuel-cell passive water-removed unit. This increases cell operating pressure limit which may improve performance and life characteristics of passive water-removal-type fuel cells.

B79-10485
MEASURING TRANSMISSIVITY OF SOLAR-CELL COVERS
E. G. LAUE (Caltech)
Jun. 1980
NPO-14638 **Vol. 4, No. 4, p. 490**

Apparatus uses simulated solar point source refracted by condensing lens to determine ratio of transmissivity of solar cell cover material to that of standard reference specimen.

B79-10486
IMPROVED DEGRADATION RESISTANCE OF (ALGA)AS LASERS
H. KRESSEL (RCA Corp.) and J. LADANY (RCA Corp.)
Jun. 1980 See also NASA-CR-3045 (N78-32405)
LANGLEY-12242 **Vol. 4, No. 4, p. 491**

Simultaneous doping with Ge and Zn improves degradation resistance of short-wavelength (AlGa)As lasers. Method opens up prospects for greatly increased reliability in lasers and LED's operating at 7,500 angstroms or below.

B79-10487
IMPROVED VAPOR-GROWTH TECHNIQUE FOR III-V COMPOUND LASERS
C. J. BUJOCCHI (RCA Corp.), G. H. OLSEN (RCA Corp.), and T. J. ZAMEROWSKI (RCA Corp.)
Jun. 1980
LANGLEY-12255 **Vol. 4, No. 4, p. 492**

Vapor Growth technique of multilayered semiconductor devices based on elements in groups 3, 4, and 5 such as transmission photo cathodes and heterojunction lasers, reduces thermal decomposition and improves performance. In addition technique allows fabrication of GaP/GaAsP/InGaP, visible CW lasers through reduction of thermal decomposition.

B79-10488
GERMANIUM-ON-INP HETEROJUNCTION-STRUCTURE LED
F. Z. HAWRYLO (RCA Corp.)
Jun. 1980
LANGLEY-12349 **Vol. 4, No. 4, p. 492**

Ge-on-InP heterojunction structure LED has been developed where in Ge film is evaporated onto commercially available InP substrate. Forward bias of device is approximately 1 volt, and it emits light in 9.800 angstrom region. Technique permits easy and inexpensive fabrication of LED for application at this wavelength.

B79-10489
IMPROVED THERMAL-CONDUCTING AND CURRENT-CONFINING FILM
F. Z. HAWRYLO (RCA Corp.)
Jun. 1980
LANGLEY-12350 **Vol. 4, No. 4, p. 493**

Ge film that replaces SiO2 coating in method of fabricating room-temperature CW laser diodes achieves greater heat dissipation while maintaining effectiveness as current-confining medium. Film also lessens certain unwanted strain parameters and ultimately increases lifetime of lasers. Method is applicable to fabrication of InP and (AlGa)As CW lasers.

B79-10490
OHMIC CONTACT TO P-TYPE INDIUM PHOSPHIDE
F. Z. HAWRYLO (RCA Corp.)
Jun. 1980

LANGLEY-12351 **Vol. 4, No. 4, p. 494**

Low-Series-resistance ohmic contact to p-type InP semiconductor material is achieved in technique utilizing Au-Ge-Zn eutectic alloy. Alloy sets and adheres well to semiconductor surface with higher acceptor concentration at metal semiconductor interface. Technique has proved satisfactory for pn junction LED's and lasers.

B79-10491
CDINP SEMICONDUCTOR ALLOY
F. Z. HAWRYLO (RCA Corp.)
Jun. 1980
LANGLEY-12405 **Vol. 4, No. 4, p. 494**

Semiconductor alloy of CdSInP deposited onto CdS substrate using liquid-phase epitaxy (LPE) employed in solvent is replacement for InP n- and p-type heterojunction layers contained in GaAsp laser devices. Alloy will aid in lowering current density of laser and enhance its longevity and CW operation at room temperature.

B79-10492
SEALED HIGH-PRESSURE X-RAY DETECTOR
P. GORENSTEIN (Smithsonian Astrophysical Observatory)
Jun. 1980
GSFC-12519 **Vol. 4, No. 4, p. 495**

Detector is filled to pressure of 2 atm with mixture of 95% xenon and 5% methane for recording hard X-ray (50-to100-keV0 images with spatial resolution of about 1 mm. Being sealed, detector requires no gas purification or replenishment after initial fill. Potential areas of application include nuclear medicine, and X-ray or gamma-ray astronomy.

B79-10493
AUTOMATICALLY CLASSIFYING EARTH FEATURES FROM ORBIT
R. L. HOLSTROM (Martin Marietta Corp.), R. T. SCHAPPELL (Martin Marietta Corp.), and J. C. TIETZ (Martin Marietta Corp.)
Jun. 1980 See also NASA-CR-158997 (N79-16339)
LANGLEY-12589 **Vol. 4, No. 4, p. 496**

Solid state circuit classifies satellite imagery by spectral signature of vegetation, bare land, water, clouds, or snow. Circuit can be used to sort and separate specific imagery by signature so that only useful data is transmitted to Earth. Device saves time and costs involved in manual separation of data.

B79-10494
FEP PLUG PROTECTS H2 MASERS
J. J. DELUCA and V. S. REINHARDT
Jun. 1980
GSFC-12552 **Vol. 4, No. 4, p. 497**

Lifetime of hydrogen-maser bulb is increased by replacing beam stop plate with thick fluorinated ethylene-propylene (FEP) plug inserted in hole opposite beam entrance stem of bulb.

B79-10495
PROGRAMABLE SOLAR-ENERGY CONTROLLER
Innovator not given (Sunkeeper Control Corp.) Jun. 1980
M-FS-25189 **Vol. 4, No. 4, p. 497**

Report characterizes commerically developed solar-energy control IPECH (integrated programmable electronic controller and hydronic) subsystem, giving information used in evaluating its performance.

B79-10496
WEATHERING OF A LIQUID SOLAR COLLECTOR
Innovator not given (Solar Energy System Division of Wyle Laboratories) Jun. 1980
M-FS-25300 **Vol. 4, No. 4, p. 498**

Commercially available flat plate hot water solar collector is characterized in report that presents 10 month weathering study of system. Collector efficiency was calculated and plotted from measurements of fluid temperature and flow rate, ambient temperature and solar flux. Windspeed and wind direction were also measured during tests.

B79-10497
TESTING OF A SOLAR COLLECTOR WITH CONCENTRATING MIRRORS
Innovator not given (Solar Energy Systems Division of Wyle Laboratories) Jun. 1980
M-FS-25310 **Vol. 4, No. 4, p. 498**

Commerical flat-plate solar collector with concentrating mirrors has been tested for thermal performance, structured behavior under static load, and effects of long-term natural weathering. Report documents results of testing and concludes that absorptivity was degraded by weathering.

B79-10498
INSTALLATION PACKAGE - HOME SOLAR HEATER
Innovator not given (Contemporary Systems, Inc.) Jun. 1980
M-FS-25338 **Vol. 4, No. 4 p. 498**

Installation of commercial solar-heating system at two story, three bedroom house in New Hampshire is described in 65 page report. System collectors are integrated part of building replacing conventional roofing or siding. Report also includes general description of system, its operation and guidelines, orientation and references.

B79-10499
MONTE CARLO VARIANCE REDUCTION
N. R. BYRN (Science Applications, Inc.)
Jun. 1980
M-FS-23645 **Vol. 4, No. 4, p. 499**

Computer program incorporates technique that reduces variance of forward Monte Carlo method for given amount of computer time in determining radiation environment in complex organic and inorganic systems exposed to significant amounts of radiation.

B79-10500
WIND-ENERGY STORAGE
L. H. GORDON
Jun. 1980 See also NASA-CR-135283 (N78-20802); NASA-CR-135284 (N78-20803); NASA-CR-135285 (N78-20804)
LEWIS-13097 **Vol. 4, No. 4, p. 499**

Program SIMWEST can model wind energy storage system using any combination of five types of storage: pumped hydro, battery, thermal, flywheel, and pneumatic. Program is tool to aid design of optional system for given application with realistic simulation for further evaluation and verification.

B79-10501
LANDSAT SIGNATURE DEVELOPMENT PROGRAM
R. A. BLAND
Jun. 1980
KSC-11113 **Vol. 4, No. 4, p. 500**

LANDSAT signature development program (LSDP) automatically produces unsupervised classification of scene from LANDSAT data tape. Program is effective enough to be useful to sophisticated remote sensing analyst yet is simple enough to be utilized by ground truth investigators who have only basic understanding of computer and remote sensing procedures.

04 MATERIALS

B79-10068
'SELF-PACKAGING' DESICCANT
R. F. FEDORS
Aug. 1979
NPO-14354 **Vol. 4, No. 1, p. 67**

Desiccant, consisting of water-soluble filler contained in water-permeable elastomeric matrix, absorbs large quantities of water without becoming sticky or releasing corrosive agents.

Desiccant may be molded into virtually any shape depending on area of application.

B79-10069
IRRADIATION PRETREATMENT FOR COAL DESULFURIZATION
G. C. HSU
Aug. 1979
NPO-14104 **Vol. 4, No. 1, p. 68**
Process using highly-penetrating nuclear radiation (Beta and Gamma radiation) from nuclear power plant radioactive waste to irradiate coal prior to conventional desulfurization procedures increases total extraction of sulfur.

B79-10070
FLUIDIZED COAL COMBUSTION
P. I. MOYNIHAN and D. L. YOUNG
Aug. 1979
NPO-14273 **Vol. 4, No. 1, p. 69**
Fluidized-bed coal combustion process, in which pulverized coal and limestone are burned in presence of forced air, may lead to efficient, reliable boilers with low sulfur dioxide and nitrogen dioxide emissions.

B79-10071
SODA ASH REMOVES SULFUR FROM FUELS
J. DOOHER (Adelphi Univ.), S. MOON (Adelphi Univ.), and D. WRIGHT (Adelphi Univ.)
Aug. 1979
GSFC-12403 **Vol. 4, No. 1, p. 69**
Test shows that adding soda ash (sodium bicarbonate) to coal/oil/water emulsion reduces 75 to 80% of sulfur dioxide gas emitted during subsequent combustion of emulsion.

B79-10072
A CONTINUOUS SILICON-COATING FACILITY
C. BUTTER (Honeywell, Inc.) and J. D. HEAPS (Honeywell, Inc.)
Aug. 1979
NPO-14373 **Vol. 4, No. 1, p. 70**
Automatic continuous silicon-coating facility is used to process 100 by 10 cm graphite-coated ceramic substrates for silicon solar cells. Process reduces contamination associated with conventional dip-coating processes, improving material service life.

B79-10073
SILICON TETRACHLORIDE SPRAY FEEDER
T. N. MEYER (Westinghouse Electric Corp.) and C. B. WOLF (Westinghouse Electric Corp.)
Aug. 1979
NPO-14382 **Vol. 4, No. 1, p. 71**
Silicon tetrachloride spray feeder mechanism is incorporated into high-temperature reactor for production of highly pure silicon intended for solar cells. Feeder supplies silicon tetrachloride as liquid droplets that rapidly vaporize in high temperature (2,000 to 2,200 K) reactor zone.

B79-10074
A REACTOR FOR MORE EFFICIENT SOLAR CELLS
M. G. FEY (Westinghouse Electric Corp.), T. N. MEYER (Westinghouse Electric Corp.), and C. B. WOLF (Westinghouse Electric Corp.)
Aug. 1979
NPO-14381 **Vol. 4, No. 1, p. 72**
Reactor produces highly pure silicon at relatively high temperature of 2,000 K. Process separates liquid silicon product from gaseous coproducts more easily than conventional lower-temperature processes. High production rates may be obtained in relatively small reaction chambers which could include means for collecting or casting silicon ingots.

B79-10075
CHEMICAL-VAPOR-DEPOSITION REACTOR
S. CHERN
Aug. 1979
NPO-14137 **Vol. 4, No. 1, p. 73**
Reactor utilizes multiple stacked trays compactly arranged in paths of horizontally channeled reactant gas streams. Design allows faster and more efficient deposits of film on substrates, and reduces gas and energy consumption. Lack of dead spots that trap reactive gases reduces reactor purge time.

B79-10076
SILICON SOURCE FOR VACUUM DEPOSITION
G. W. RACETTE (General Electric Co.) and D. J. RUTECKI (General Electric Co.)
Aug. 1979
LANGLEY-12356 **Vol. 4, No. 1, p. 74**
Device using two independent silicon sources for ultra-high-vacuum deposition on large substrates can deposit P and N types of silicon simultaneously. Efficient water cooled copper shield supports and cools structure and isolates two filaments.

B79-10077
LOW ABSORPTANCE PORCELAIN-ON-ALUMINUM COATING
H. LEGGETT
Aug. 1979
M-FS-23879 **Vol. 4, No. 1, p. 75**
Porcelain thermal-control coating for aluminum sheet and foil has solar absorptance of 0.22. Specially formulated coating absorptance is highly stable, changing only 0.03 after 1,000 hours of exposure to simulated sunlight and can be applied by standard commercial methods.

B79-10078
BURNING CRUDE OIL WITHOUT POLLUTION
J. HOUSEMAN
Aug. 1979
NPO-14344 **Vol. 4, No. 1, p. 76**
Crude oil can be burned at drilling sites by two-stage combustion process without producing pollution. Process allows easier conformance to strict federal or state clean air standards without installation of costly pollution removal equipment. Secondary oil recovery can be accomplished with injection of steam heating by burning oil.

B79-10079
CONTINUOUS STERILIZATION OF PLUMBING SYSTEMS
C. J. BRYAN, C. V. MOYERS, and E. E. WRIGHT, JR.
Aug. 1979
KSC-11085 **Vol. 4, No. 1, p. 77**
Continuous sterilization of plumbing, such as in hospitals, clinics, and biological testing laboratories is possible with ethylene oxide/Freon 12 (ETO/F-12) humidifier developed for sterilization of potable water systems.

B79-10080
CONTROLLED METAL-FILM DEPOSITION ON ALUMINA SUBSTRATES
E. H. LEE, R. D. MOORHEAD, and H. POPPA
Aug. 1979
ARC-11214 **Vol. 4, No. 1, p. 78**
Report describes results of investigation of preparation, nucleation and controlled growth of particulate deposits (palladium and iron) on electron-transparent alumina substrates. Results indicate that characteristic properties of metal deposits are strongly dependent on cleanliness, phase, and crystallographic orientation of substrate.

B79-10208
THERMOLUMINESCENCE ANALYSIS OF AEROSOLS
E. R. LONG, JR. and R. S. ROGOWSKI
Dec. 1979 See also NASA-TM-X-72795 (N76-21743)
LANGLEY-12046 **Vol. 4, No. 2, p. 219**
Method is presented for identifying air pollutants in field or laboratory by technique based on thermoluminescence. Approach is useful in tracing dispersion of pollutants over geographical regions and in determining cancer causing agents in the upper atmosphere.

B79-10209
INSTRUMENT FOR AEROSOL CHARACTERIZATION
G. VARSI (Caltech)
Dec. 1979
NPO-14320 **Vol. 4, No. 2, p. 220**
Differential pumping system that directs particles into beam moving at high speed measures size distribution and chemical composition of aerosols and is useful in study of atmospheric contamination, smog, stack gases, and chemical aerosols.

B79-10210
REMOTE MEASUREMENT OF ATMOSPHERIC POLLUTANTS
F. ALLARIO, J. HOELL, and R. K. SEALS
Dec. 1979
LANGLEY-12277 **Vol. 4, No. 2, p. 221**
The concentration and vertical distribution of atmospheric ammonia and ozone are remotely sensed, using dual-C02-laser multichannel infrared Heterodyne Spectrometer (1HS). Innovation makes atmospheric pollution measurements possible with nearly-quantum-noise-limited sensitivity and ultrafine spectral resolution.

B79-10211
MONITORING HARMFUL GASES
W. R. HELMS and J. R. STETTER (Energetics Science, Inc.)
Dec. 1979 See also NASA-CR-153048 (N77-23439);NASA-CR-155770 (N78-18224)
KSC-11086 **Vol. 4, No. 2, p. 222**
Instruments are developed for monitoring presence of hydrazine and nitrogen dioxide in air. Nitrogen dioxide and hydrazine are highly toxic and explosive substances used in propellants for rocket engines. Instruments discussed are inexpensive and most useful for detecting above substances in concentrations as low as few parts per million.

B79-10212
WATER-SOLUBLE FLUOROCARBON COATING
P. NANELLI (Pennwalt Corp.)
Dec. 1979 See also B79-10213
MSC-16562 **Vol. 4, No. 2, p. 223**
Water-soluble fluorocarbon proves durable nonpolluting coating for variety of substrates. Coatings can be used on metals, masonry, textiles, paper, and glass, and have superior hardness and flexibility, strong resistance to chemicals fire, and weather.

B79-10213
WATER-BASED INTUMESCENT PAINT
D. G. SAUERS and P. NANNELLI (Pennwalt Corp.)
Dec. 1979 See also B79-10212
MSC-16609 **Vol. 4, No. 2, p. 224**
Article discusses fire-resistant water-based paints made by adding intumescing agents to fluorocarbon coatings. Since these paints are water-based, they do not pollute atmosphere as they dry and can be used in a closed-loop air-recirculation system in spacecraft and submarines.

B79-10214
HIGH-TEMPERATURE ADHESIVES FOR POLYIMIDE FILMS
A. K. ST. CLAIR, T. L. ST. CLAIR, and W. S. SLEMP
Dec. 1979
LANGLEY-12348 **Vol. 14, No. 2, p. 224**
Linear condensation polyimides which are high-temperature polymers show promise as adhesives which form flexible film coatings compatible with polyimide films. Materials are advantageous since they can be supplied as flexible tape, already B-staged and ready for bonding.

B79-10215
MODIFIED POLYMERS FOR GAS CHROMATOGRAPHY
F. H. WOELLER (San Jose State Univ), W. CHRISTENSEN, and L. MAYER (San Jose State Univ.)
Dec. 1979
ARC-11154 **Vol. 4, No. 2, p. 226**
Polymeric materials are modified to serve as stationary phase in chromatographic columns used for separation of atmospheric gases. Materials simplify and improve separation of atmospheric gases in terms of time, quantity of material needed, and sharpness of separation.

B79-10216
DETERMINING RESIN/FIBER CONTENT OF LAMINATES
G. G. GARRARD (Rockwell International Corp.) and D. W. HOUSTON (Rockwell International Corp.)
Dec. 1979
LANGLEY-12442 **Vol. 4, No. 2, p. 227**
Article discusses procedure where hydrazine is used to extract graphite fibers from cured polyimide resin. Method does not attack graphite fibers and is faster than hot-concentrated-acid digestion process.

B79-10217
SYNTHESIS OF TRIARYLTRIFLUOROETHANES
R. W. ROSSER and W. D. KRAY (Talladega College)
Dec. 1979
ARC-11097 **Vol. 4, No. 2, p. 228**
Article discusses preparation of triary1-2,2,2-trifluoroethants prepared from a,a,a-trifluoroacetone by condensation with various substituted aromatic compounds. Compounds are useful as they have high thermal stability.

B79-10218
FLAT-FLAME BURNER
G. C. FRYBURG, F. J. KOHL, R. A. MILLER, and C. A. STERNS
Dec. 1979 See also NASA-TM-X-73600 (N77-19209);NASA-TM-73794 (N78-13157); B79-10219
LEWIS-13161 **Vol. 4, No. 2, p. 229**
Aqueous solutions of inorganic salts are aspirated and then nebulized into mixing chamber of flat-flame burner to study behavior of inorganic salts in flames.

B79-10219
HIGH-PRESSURE MASS-SPECTROMETRIC SAMPLING SYSTEM
G. C. FRYBURG, F. J. KOHL, R. A. MILLER, and C. A. STERNS
Dec. 1979 See also NASA-TM-73720 (N77-32242), B79-10218
LEWIS-12913 **Vol. 4, No. 2, p. 230**
Mass spectrometric sampler directs sampling of gaseous species from systems at atmospheric pressure. Method is accomplished through orifice machined in platinum cone.

B79-10220
ANALYSIS OF FATIGUE DAMAGE IN COMPOSITES
J. D. WHITCOMB
Dec. 1979 See also NASA-TM-78693 (N78-23457)
LANGLEY-12431 **Vol. 4, No. 2, p. 231**
Finite-element heat-transfer analysis determines sites of potential failure in composite materials. Method is sensitive to matrix damage and fiber disbonding that occurs long before actual fiber breakage.

B79-10221
STRENGTH ENHANCEMENT OF PREALLOYED POWDER SUPERALLOYS
J. C. FRECHE and W. J. WATERS
Dec. 1979 See also NASA-TM-78834 (N78-21266)
LEWIS-13173 **Vol. 4, No. 2, p. 232**
Strengthening and forming process for prealloyed powder superalloys greatly increases material strength in the 900-1,200 F temperature range. Process which involves superplastically-deforming compacted powders at controlled rates and temperature is most effective on nickel-base alloys.

B79-10222
IMPROVED ION-SELECTIVE MEMBRANES
S. S. ALEXANDER (Ionics, Inc.)
Dec. 1979 See also NASA-CR-134931 (N76-18670); NASA-CR-135316 (N78-18515); NASA-TM-73751 (N78-14631); NASA-TM-73873 (N78-19656); B76-10070
LEWIS-12678 **Vol. 4, No. 2, p. 233**
Ion-selective membranes are developed in evolution of

REDOX (reduction-oxidation) electrochemical bulk energy storage concept which have exceptional selectivity giving three orders of magnitude improvement over commercially available membranes.

B79-10223
IMPROVED INVERTED STEPANOV APPARATUS
S. BERKMAN (RCA Corp.) and H. E. TEMPLE (RCA Corp.)
Dec. 1979
NPO-14297 **Vol. 4, No. 2, p. 234**
Modifications in inverted Stepanov process improve heat transfer and energy efficiency in growing silicon ribbon crystals. Using system, silicon is directly heated by induction, minimizing heat transfer and contamination problems.

B79-10224
FIBROUS REFRACTORY COMPOSITE INSULATION
H. E. GOLDSTEIN, M. SMITH, and D. B. LEISER (Stanford Univ.)
Dec. 1974
ARC-11169 **Vol. 4, No. 2, p. 235**
Family of high-temperature, low-density refractory composite insulations made from aluminoborosilicate and silica fibers has insulating material with improved mechanical and thermal properties. Composition is useful for reusable heat-shield materials.

B79-10225
FATIGUE PROPERTIES OF COLUMBIUM ALLOY
R. A. CROSBY (The Marquardt Co.) and F. K. LAMPSON (The Marquardt Co.)
Dec. 1979
MSC-18256 **Vol. 4, No. 2, p. 235**
Report presents data from series of tests undertaken to determine room-temperature fatigue properties of C-103 columbium alloy and its combination with Ti-6Al-4V weldments.

B79-10226
USE OF COMPOSITES IN ELECTRIC VEHICLES
R. H. DAWE (Caltech), D. B. EDWARDS (Caltech), and H. A. FRANK (Caltech)
Dec. 1979
NPO-14615 **Vol. 4, No. 2, p. 236**
Report presents study of weight savings in electric vehicles by using alternative structural materials, particularly composites. Topics discussed include safety, aerodynamics, esthetics, and cost.

B79-10353
FLAME-RESISTANT TEXTILES
L. C. FOGG (Sci. Appl., Inc.), R. S. STRINGHAM (Sci. Appl., Inc.), and M. S. TOY (Sci. Appl., Inc.)
Apr. 1980 See also NASA-CR-151834 (N79-10149)
MSC-18359 **Vol. 4, No. 3, p. 369**
Flame resistance treatment for acid resistant polyamide fibers involving photoaddition of fluorocarbons to surface has been scaled up to treat 10 yards of commercial width (41 in.) fabric. Process may be applicable to other low cost polyamides, polyesters, and textiles.

B79-10354
FOUR-STEP REACTION FOR POLYTRIAZINE ELASTOMERS
R. W. ROSSER and R. A. KORUS (San Jose State University)
Apr. 1980
ARC-11248 **Vol. 4, No. 3, p. 370**
Four step imidoylamidine reaction sequence is used to make crosslinked polyperfluoralkyltriazines with superior elastomeric properties, greater molecular weight, and crosslinking control. Polymers can find useful application in fuel tank sealants, o-ring, wire enamels, pneumatic ducts, and many other applications.

B79-10355
HEAT- AND CHEMICAL-RESISTANT OXDIAZOLE ELASTOMERS
R. W. ROSSER, H. KWONG (San Jose State Foundation), and I. M. SHALHOUB (San Jose State Foundation)
Apr. 1980
ARC-11253 **Vol. 4, No. 3, p. 371**
Heat and chemical resistant polymers with triazine crosslinks are prepared by thermal condensation reactions to form 1,2,4-oxdiazole linkages. They are compounded with variety of fillers, extenders, and modifiers for numerous applications in which stability, impermiability to liquids and gases, good plasticity, and elasticity or rigidity are important.

B79-10356
SYNTHESIS OF 2, 4, 8, 10-TETROXASPIRO (5.5) UNDECANE
A. C. POSHKUS (National Res. Council)
Apr. 1980
ARC-11243 **Vol. 4, No. 3, p. 371**
Method drastically reduces preparation time pentaerythritol diformal from several hours to time span of 3 to 20 minutes with yields greater than 90 percent. Other advantages include elimination of solvents, decrease in labor and energy needs, adaptability to continuous operations, and overall simplicity and convenience.

B79-10357
RELATING VISCOSITY TO POLYMER CONCENTRATION
R. F. FEDORS (Caltech)
Apr. 1980
NPO-14609 **Vol. 4, No. 3, p. 372**
Equation developed by VanDijk and first applied to viscosity of Newtonian suspension of rigid particles by Eilers is rearranged to yield intrinsic viscosity as explicit function of polymer concentration in polymer solvent system. Experiments have shown relationship valid for polymer solutions having relative viscosities ranging from 1 to 100.

B79-10358
SIMPLE ESTIMATE OF CRITICAL VOLUME
R. F. FEDORS (Caltech)
Apr. 1980
NPO-14464 **Vol. 4, No. 3, p. 373**
Method for estimating critical molar volume of materials is faster and simpler than previous procedures. Formula sums no more than 18 different contributions from components of chemical structure of material, and is as accurate (within 3 percent) as older more complicated models. Method should expedite many thermodynamic design calculations.

B79-10359
EQUILIBRIUM SWELLING OF ELASTOMERS IN SOLVENTS
R. F. FEDORS (Caltech)
Apr. 1980
NPO-14637 **Vol. 4, No. 3, p. 374**
Two proposed empirical equations, developed from Eilers-VanDijk equation to characterize relative modulus of filled elastomers as function of filler content, describe: (1) equilibrium swelling for cases where fillers are composed of permanent aggregates of primary particles; and (2) equilibrium swelling when filler material is composed of non-aggregated particles.

B79-10360
DOUBLE-WALL TUBING FOR OIL RECOVERY
L. H. BACK (Caltech), W. F. CARROLL (Caltech), L. D. JAFFEE (Caltech), and L. D. STIMPSON (Caltech)
Apr. 1980 See also B79-10369
NPO-14606 **Vol. 4, No. 3, p. 375**
Insulated double-wall tubing designed for steam injection oil recovery makes process more economical and allows deeper extension of wells. Higher quality wet steam is delivered through tubing to oil deposits with significant reductions in heat loss to surrounding rock allowing greater exploitation of previously unworkable reservoirs.

B79-10361
POST-PROCESSING FLAME-RETARDANT FOR POLYURETHANE
P. MONAGHAN (Arthur D. Little, Inc.) and K. R. SIDMAN (Arthur D. Little, Inc.)
Apr. 1980 See also NASA-CR-144362 (N75-29264)

MSC-16307 **Vol. 4, No. 3, p. 376**

Treatment of polyurethane form with elastomer formulation after processing makes foam fire resistant without compromising physical properties. In testing, once ignition source is removed, combustion stops. Treatment also prevents molten particle formation, generates no smoke or toxic gases in fire, and does not deteriorate under prolonged exposure to Sun.

B79-10362
OZONE INHIBITS CORROSION IN COOLING TOWERS
K. R. FRENCH (Caltech), R. D. HOWE (Caltech), and M. F. HUMPHREY (Caltech)
Apr. 1980
NPO-14340 **Vol. 4, No. 3, p. 377**

Commercially available corona discharge ozone generator, fitted onto industrial cooling tower, significantly reduces formation of scales (calcium carbonate) and corrosion. System also controls growth of algae and other microorganisms. Modification lowers cost and improves life of cooling system.

B79-10363
MEASURING COAL THICKNESS
C. BARKER (Univ. of Missouri at Rolla), J. BLAINE (Univ. of Missouri at Rolla), G. GELLER (Univ. of Missouri at Rolla), R. ROBINSON (Univ. of Missouri at Rolla), D. SUMMERS (Univ. of Missouri at Rolla), and J. TYLER
Apr. 1980
M-FS-23979 **Vol. 4, No. 3, p. 378**

Laboratory tested concept, for measuring thickness of overhead coal using noncontacting sensor system coupled to controller and high pressure water jet, allows mining machines to remove virtually all coal from mine roofs without danger of cutting into overlying rock.

B79-10364
PRECISE WET-CHEMICAL ETCHING
F. J. GRUNTHANER (Caltech)
Apr. 1980
NPO-14339 **Vol. 4, No. 3, p. 379**

Controlled amount of etchant applied to surface of rotating sample removes only few angstroms of material. Technique is suited to study of chemical and crystal structures. Rate can be varied through control of spin frequency, liquid viscosity, droplet size, total etchant volume, etchant concentration.

B79-10365
DETECTING OXYGEN IN HYDROGEN OR HYDROGEN IN OXYGEN
A. C. ERICKSON (General Electric Co.)
Apr. 1980
MSC-18380 **Vol. 4, No. 3, p. 380**

Catalytic sensor operates in high-pressure, moisture-laden gases. It was developed for life support system in which water is decomposed by electrolysis to produce oxygen and hydrogen. Sensor has potential applications in gas-detection and measurement instruments, particularly for gases generated by electrolysis, because such gases may contain large amounts of moisture.

B79-10366
AN IMPROVED CAPILLARY RHEOMETER
S. P. FEINSTEIN (Caltech)
Apr. 1980
NPO-14501 **Vol. 4, No. 3, p. 380**

Capillary rheometer incorporates cone-tipped preheated piston to compress plastized coal sample through narrow tube. Applied force is proportional to viscosity and is recorded on separate instrument. Samples are heated rapidly due to large area of cone surface. Device, primarily applied in designing efficient equipment for feeding coal into combustion chamber, may be readily used in other viscosity studies.

B79-10367
NEW APPROACH TO PURIFYING SILICON
R. E. CHANEY (Motorola, Inc.), W. M. INGLE (Motorola, Inc.), and S. W. THOMPSON (Motorola, Inc.)
Apr. 1980
NPO-14474 **Vol. 4, No. 3, p. 381**

Silicon tetrafluoride gas removes metallurgical-grade impurities when passed over silicon in quartz tube. Technique allows inexpensive increase in throughout rate. Approach could improve silicon production for silicon solar cells.

B79-10368
COMPACT REACTOR FOR ONBOARD HYDROGEN GENERATION
T. A. BRABBS
Apr. 1980 See also NASA-TP-1247 (N78-23256)
LEWIS-13033 **Vol. 4, No. 3, p. 382**

Hydrogen, chemically stored as methanol, is promising internal-combustion fuel. Methanol is readily obtainable from natural products such as wood, compost, or various organic wastes. Steam reformation of methanol as source for hydrogen is relatively simple operation.

B79-10369
WATER-COOLED INSULATED STEAM-INJECTION WELLS
L. H. BACK (Caltech) and L. D. JAFFE (Caltech)
Apr. 1980
NPO-14605 **Vol. 4, No. 3, p. 383**

Water is used as insulated coolant and heat-transfer medium for steam-injection oil wells. Approach is somewhat analogous to cooling system in liquid-propellant rocket. In addition to trapping and delivering heat to steam-injection point, water will also keep casing cooler, preventing or reducing casing failures caused by thermal stresses.

B79-10370
HIGH-TEMPERATURE INSULATION
R. E. MOWERS (Rockwell Intern. Corp.) and A. C. PETERSON (Rockwell Intern. Corp.)
Apr. 1980
M-FS-19498 **Vol. 4, No. 3, p. 384**

Lightweight insulating material works over very broad temperature range. Material is unaffected by moisture or hydraulic oil and is usable at temperatures ranging from 2,200 F (1,200 C) to cryogenic levels. It is readily applied to number of high-temperature and cryogenic processes.

B79-10371
MOSSBAUER STUDY OF FESI2 AND FESE THIN FILMS
K. AGGARWAL, W. T. ESCUE, and R. G. MENDIRATTA
Apr. 1980
M-FS-25088 **Vol. 4, No. 3, p. 384**

Structural studies of FeSi2 and FeSe thin films have been conducted via Mossbauer spectroscopy as continuation of earlier investigation of FeTe films. Results discuss structures of bulk and thin-film FeSi2 and bulk and thin-film FeSe.

B79-10372
STRESS CORROSION IN HIGH-STRENGTH ALUMINUM ALLOYS
R. C. DORWARD (Kaiser Aluminum and Chemical Corp.) and K. R. HASSE (Kaiser Aluminum and Chemical Corp.)
Apr. 1980
M-FS-23986 **Vol. 4, No. 3, p. 385**

Report describes results of stress-corrosion tests on aluminum alloys 7075, 7475, 7050, and 7049. Tests compare performance of original stress-corrosion-resistant (SCR) aluminum, 7075, with newer, higher-strength SCR alloys. Alloys 7050 and 7049 are found superior in short-transverse cross-corrosion resistance to older 7075 alloy; all alloys are subject to self-loading effect caused by wedging of corrosion products in cracks. Effect causes cracks to continue to grow, even at very-low externally applied loads.

B79-10373
TEMPERATURE AND MOISTURE ANALYSIS IN COMPOSITES
D. R. TENNEY, S. S. TOMPKINS, and J. UNNAM (Geo. Washington Univ.)
Apr. 1980
LANGLEY-12452 **Vol. 4, No. 3, p. 385**

Advanced fiber-reinforced polymeric matric composites have emerged as strong candidate materials for airframe applications. Favorable aspects include high strength, stiffness, and low density. Temperature and Moisture Analysis in Composites (TMAC) program was developed to study effect of variations in diffusion coefficients, surface properties, panel tilt, ground reflection, and geographical location on moisture-concentration profiles and average moisture contents of composite laminates.

B79-10502
SIMULTANEOUS STACK-GAS SCRUBBING AND WASTE WATER TREATMENT
J. C. PORADEK and D. D. COLLINS (Chemsoil Corp.)
Jun. 1980 See Also NASA-CR-160280 (N80-12620)
MSC-16258 **Vol. 4, No. 4, p. 503**
Simultaneous treatment of wastewater and S02-laden stack gas make both treatments more efficient and economical. According to results of preliminary tests, solution generated by stack gas scrubbing cycle reduces bacterial content of wastewater. Both processess benefit by sharing concentrations of iron.

B79-10503
LOW COST DISPOSAL OF MMH
J. J. THOMAS (Florida Institute of Technology) and T. FRENCH (Florida Institute of Technology)
Jun. 1980
KSC-11135 **Vol. 4, No. 4, p. 504**
Concentration of gaseous toxic monomethylhydrazine (MMH) can be removed at 99.9% efficiency using scrubbers containing acetylacetone solutions as scrubbing liquors. Resulting product is easily disposable and expensive liners for protecting scrubber from strong oxidizing agents are not needed.

B79-10504
A LOW-COST MOLECULAR-LEAK VALUE
C. M. JUDSON (Analog Technology Corp.), J. L. LAWRENCE, JR. (Analog Technology Corp.), and F. P. PICKETT (Analog Technology Corp.)
Jun. 1980
LANGLEY-12249 **Vol. 4, No. 4, p. 505**
Solenoid operated modular-leak and shutoff valve has been developed for small portable, automated, mass spectrometer used to measure trace constituents of air or other gases. Valve costs much less to produce than precision needle-in-foil type. Yet its performance closely matches that version.

B79-10505
IMPROVED SYNTHESIS OF POLYFORMALS
A. C. POSHKUS
Jun. 1980
ARC-11244 **Vol. 4, No. 4, p. 506**
Polyformals are prepared in less than 15 min. as opposed to hours or days by conventional processes. Product can be converted into ethylencially unsaturated monomers and into aphrogenic and pyrostatic phosphorylated derivatives and the like.

B79-10506
SEPARATING LIQUID AND GASEOUS SOLUTIONS
J. W. BENEFIELD (Lockheed Aircraft Corp.) and P. GRODZKA (Lockheed Aircraft Corp.)
Jun. 1980
M-FS-23368 **Vol. 4, No. 4, p.506**
Clusius-Dickel separation (CDS) technique, currently used in laboratory scale separation of certain isotopes, may find more effective applications in low-gravity, space environments. Many advantages in power supply, mechanical stresses, and spatial arrangement can be realized in space, making technique suitable for biological and polymer separations.

B79-10507
SELF-CURING POLYIMIDE FOAM
S. R. RICCITIELLO and P. M. SAWKO
Jun. 1980
ARC-11170 **Vol. 4, No. 4, p. 507**
Chemical formulation produces foamed polyimide plastic without external heat. Foam is less dense and more flame and acid resistant than conventional polyimide foams. Self curing foam can be formed 'onsite' in limited access locations where application of heat is difficult or impossible.

B79-10508
COMPOSITES OF IMMISCIBLE METALS
M. H. JOHNSTON, J. C. MCCLURE, and R. A. PARR
Jun. 1980
M-FS-23816 **Vol. 4, No. 4, p. 508**
Process aids development of composites of metals that are immiscible in liquid plase. Aligned uniformly dispersed spheres or rods of bismuth in aluminum, lead in aluminum, bismuth in zinc, and other systems have been prepared. Dispersed and matrix metal are selected according to desired electrical or mechanical properties.

B79-10509
VACUUM-BONDED COVERING WITHSTANDS LOW TEMPERATURES
G. LERMA (Rockwell International Corp.) and Z. SIMINSKI (Rockwell International Corp.)
Jun. 1980
MSC-16235 **Vol. 4, No. 4, p. 509**
Aluminum foil, tetrafluoroethylene (TEF), and glass fabric are vacuum bonded together to make composite covering material that is flexible, easy to handle, and unaffected by cryogenic temperatures.

B79-10510
LONGER SHELF LIFE FOR CERAMIC SLURRIES
Y. D. IZU (Lockheed Missiles and Space Co.) and T. M. TANABE (Lockheed Missiles and Space Co.)
Jun. 1980
MSC-18543 **Vol. 4, No. 4, p. 509**
Viscosity of ceramic-coating slurries containing organic acrylate viscosity-control agent is stabilized for over 2 months by addition of ammonium hydroxide without significant changes.

B79-10511
SHEAR STRENGTH OF ALUMINUM FILLET WELDS
C. V. LOVOY
Jun. 1980 See also NASA-TM-78168 (N78-21495)
M-FS-23946 **Vol. 4, No. 4, p. 510**
Shear-strength tests on aluminum fillet welds are documented in report. Tests were made on aluminum alloy 2219 to aid designers in specifying sizes and lengths of fillet welds necessary to sustain expected loads in this material. Report discusses fillet-weld size and geometry, including root penetration and surface contour.

B79-10512
ENGINEERING PROPERTIES OF INCOLOY-903 AND CTX-1
P. E. RUFF (Battelle Memorial Inst.)
Jun. 1980
M-FS-23359 **Vol. 4, No. 4, p. 510**
Engineering properties of Incoloy-903 sheet and CTX-1 (high strength austentic Fe-Ni-Co alloy) bar are characterized in report. Report includes tables and plots of test data and photographs of microstructure of samples used. Two appendixes include specimen configuration and data collected from industrial survey.

B79-10513
UNRESOLVED MOSSBAUER HYPERFINE SPECTRA
J. R. SCHIESS and J. J. SINGH
Jun. 1980
LANGLEY-12439 **Vol. 4, No. 4, p. 511**
Program analyzes unresolved Mossbauer hyperfine spectra resulting from existence of several local environments in dilute binary iron alloys. It has proven useful in studying effects of impurity atoms on iron Mossbauer spectra.

B79-10514
SINGLE-, TWO-, AND THREE-PHASE BINARY-ALLOY SYSTEMS
D. R. TENNEY
Jun. 1980

LANGLEY-12381 **Vol. 4, No. 4, p. 511**

Series of three computer programs solve one dimensional transient diffusion problems in single and multiphase binary-alloy systems. Accurate understanding of diffusion process in binary-alloy system is important for development of metal matrix composites, some protective coatings, and thin-film technology.

05 LIFE SCIENCES

B79-10081
HIGH-RESOLUTION ECHOCARDIOGRAPHY
R. NATHAN
Aug. 1979
NPO-14349 **Vol. 4, No. 1, p. 81**

High resolution computer aided ultrasound system provides two and three dimensional images of beating heart from many angles. System provides means for determining whether small blood vessels around the heart are blocked or if heart wall is moving normally without interference of dead and noncontracting muscle tissue.

B79-10082
MICROCOMPUTER HELPS EVALUATE SKIN BURNS
V. J. ANSELMO and T. H. REILLY
Aug. 1979
NPO-14402 **Vol. 4, No. 1, p. 82**

Microcomputer analysis of multispectral imaging of burn area aids production of display map of field and partial thickness burns making more effective clinical treatment possible.

B79-10083
ARTIFICIAL LIMB CONNECTOR
C. W. BRIGHT, L. J. OWENS, V. MOONEY (Rancho Los Amigos Hospital), and J. B. RESWICK (Rancho Los Amigos Hospital)
Aug. 1979
KSC-11069 **Vol. 4, No. 1, p. 83**

Flexible connector gives skin freedom needed to self-adjust to promote healing of flesh and to relieve skin stresses while maintaining skin seal surrounding implanted percutaneous sleeve used with bone fixation prosthetic connector.

B79-10084
EYE-CONTROLLED SWITCH
G. L. WALKER (Hayes International Corp.) and B. G. WEAVER (Hayes International Corp.)
Aug. 1979
M-FS-25091 **Vol. 4, No. 1, p. 84**

Eye motion sensor clipped to standard eyeglass frame and circuit allows electric wheel chair to be controlled by eye movements alone.

B79-10085
IDENTIFICATION OF MICRO-ORGANISMS
G. R. TAYLOR and S. N. ZALOGUEV (U.S.S.R. Ministry of Health)
Aug. 1979 See also NASA-TM-58185 (N78-29725)
MSC-18358 **Vol. 4, No. 1, p. 85**

Manual presents detailed laboratory procedures for identifying aerobic or microaerobic bacteria, yeast or yeastible organisms, and filamentous fungi and conducting other microbiological or immunological evaluations of samples taken from human subjects. Standardized procedures should be useful to researchers and clinicians in laboratories, hospitals and other biological test facilities.

B79-10227
IMPROVED TEMPERATURE-CONTROL GARMENT
R. L. COX (Vought Corp.) and C. W. HIXON (Vought Corp.)
Dec. 1979
ARC-11239 **Vol. 4, No. 2, p. 239**

Multilayer fabric containing polyurethane tubing is used in fabrication of liquid cooled garments. Cooling helmets may be assembled from material and various garments used for heating can be developed.

B79-10228
PLATINUM ELECTRODES FOR ELECTROCHEMICAL DETECTION OF BACTERIA
J. R. WILKINS
Dec. 1979 See also B78-10236
LANGLEY-12462 **Vol. 4, No. 2, p. 240**

Bacteria is detected electro-chemically by measuring evolution of hydrogen in test system with platinum and reference electrode. Using system, electrodes of platinum are used to detect and enumerate varieties of gram-positive and gram-negative organisms compared in different media.

B79-10229
WIDEBAND ELECTRONICS FOR ULTRASONIC TISSUE CHARACTERIZATION
P. GAMMELL (Caltech)
Dec. 1979
NPO-14461 **Vol. 4, No. 2, p. 241**

System utilizing natural ringing frequency of electronic circuit coupled to wideband transducer is used to determine frequency dependence of ultrasonic properties of tissue. With procedure frequency data can be obtained rapidly and inexpensively.

B79-10230
COUPLER FOR SURGERY ON SMALL ANIMALS
J. E. JOHNSON, JR. and P. F. SWARTZ
Dec. 1979
ARC-11114 **Vol. 4, No. 2, p. 242**

Minicoupler simplifies exchange of fluids with organs of laboratory animals enabling one person to perform surgery on experimental animals such as rats and mice. Innovation eliminates obstructing hands and instruments from areas of surgery.

B79-10231
CINEMICROGRAPHIC SPECIMEN HOUSING
J. R. WILKINS
Dec. 1979
LANGLEY-12047 **Vol. 4, No. 2, p. 243**

Housing used to observe gravitation effects on specimens embedded in support media, such as agar, supports microbial specimens vertically for time-lapsed cinemicrographic studies. Procedure cannot be performed with conventional microscopes which see specimens in horizontal plane only.

B79-10232
IMPROVED CAPACITIVE EKG ELECTRODE
J. L. DAY, M. E. GRIFFITH (Texas Tech Univ.), W. M. PORTNOX (Texas Tech Univ.), and L. J. STOTTS (Texas Tech Univ.)
Dec. 1979
MSC-18321 **Vol. 4, No. 2, p. 244**

Light, compact electrode monitors heart signals through burn ointment and requires no electrolyte paste for coupling to skin. Innovation is useful because of its ability to monitor heart condition of burn victims.

B79-10233
LOW-DOSE TOTAL-BODY-CALCIUM ANALYSIS
T. K. LEWELLEN (Washington Univ.) and W. B. NELP (Washington Univ.)
Dec. 1979 See also NASA-CR-151675 (N78-22696)
MSC-18282 **Vol. 4, No. 2, p. 245**

Report details technique for measuring total body calcium by collecting exhaled 37Ar gas after exposure of patients to 14-MeV neutrons. Summary for theoretical basis of technique is presented.

B79-10234
ANTHROPOMETRIC SOURCEBOOK
R. L. BOND, J. T. JACKSON, A. J. LOUVIERE, and W. E. THORNTON
Dec. 1979 See also NASA-RP-1024 (N79-11734); NASA-RP-1024 (N79-13711); NASA-RP-1024 (N79-13712)

MSC-18500 **Vol. 4, No. 2, p. 245**

Three volume 'Anthropometric Source Book' contains large body of anthropometric data, design information, and references. Subjects covered include variability in body size, mass distribution properties of human body, arm and leg reach, joint motion and numerous other materials.

B79-10235
ANALYZING WATER RESOURCES
Innovator not given (Ecosystems International, Inc.) Dec. 1979 See also NASA-CR-150467 (N78-13509)
M-FS-25104 **Vol. 4, No. 2, p. 245**

Report on water resources discusses problems in water measurement demand, use, and availability. Also discussed are sensing accuracies, parameter monitoring, and status of forecasting, modeling, and future measurement techniques.

B79-10374
IMPROVEMENT OF CAT SCANNED IMAGES
E. ROBERTS, JR.
Apr. 1980 See also NASA-TM-78974 (N78-31690); NASA-TN-D-8529 (N77-29539)
LEWIS-13276 **Vol. 4, No. 3, p. 389**

Digital enhancement procedure improves definition of images. Tomogram is generated from large number of X-ray beams. Beams are collimated and small in diameter. Scanning device passes beams sequentially through human subject at many different angles. Battery of transducers opposite subject senses attenuated signals. Signals are transmitted to computer where they are used in construction of image on transverse plane through body.

B79-10375
IMPROVED OPTICS FOR AN ULTRACENTRIFUGE
C. G. MILLER (Caltech) and J. B. STEPHENS (Caltech)
Apr. 1980
NPO-13657 **Vol. 4, No. 3, p. 390**

Ultracentrifuge is important tool in study of polymers, biomolecules, and cell structures. In typical ultracentrifuge rotor supports pair of optically matched vials; one contains sample mixed in solvent, and other is reference that contains only solvent. Doubleslit optical system, transverse to rotor, creates interference pattern on photographic plate each time vials pass through optics. Medium in sample vial displaces interference maximums such that shift gives measurement of density distribution along length of sample.

B79-10376
IMPROVED MICROBIAL-CHECK-VALVE RESINS
G. V. COLOMBO (Umpqua Research Co.) and D. F. PUTNAM (Umpqua Research Co.)
Apr. 1980 See also NASA-CR-151678 (N78-22719); (NASA-CR-151843 (N79-11733)
MSC-18377 **Vol. 4, No. 3, p. 392**

Improved microbial-check-valve resins have been tested for their microbicidal effectiveness and long-term stability. Resins give more stable iodine concentrations than previous preparations and do not impart objectionable odor or taste to treated water. Microbial check valve is small cylindrical device, packed with iodide-saturated resin, that is installed in water line where contamination by micro-organisms is to be prevented. Prototype microbial check valve was tested for stability and performance under harsh environmental conditions. Effectiveness was 100 percent at 35 deg, 70 deg, and 160 deg F (2 deg, 21 deg, and 71 deg C).

B79-10377
COMPUTER MEASUREMENT OF ARTERIAL DISEASE
J. ARMSTRONG (Caltech), R. H. SELZER (Caltech), R. BARNDT (Univ of Southern Calif.), D. H. BLANKENHORN (Univ. of Southern Calif.), and S. BROOKS (Univ. of Southern Calif.)
Apr. 1980
NPO-14266 **Vol. 4, No. 3, p. 393**

Image processing technique quantifies human atherosclerosis by computer analysis of arterial angiograms. X-ray film images are scanned and digitized, arterial shadow is tracked, and several quantitative measures of lumen irregularity are computed. In other tests, excellent agreement was found between computer evaluation of femoral angiograms on living subjects and evaluation by teams of trained angiographers.

B79-10515
INDIRECT MICROBIAL DETECTION
J. R. WILKINS
Jun. 1980
LANGLEY-12520 **Vol. 4, No. 4, p. 515**

Indirect method for detection of microbial growth utilizes flow of charged particles across barrier that physically separated growing cells from electrodes and measures resulting difference in potential between two platinum electrodes. Technique allows simplified noncontact monitoring of all growth in highly infectious cultures or in critical biochemical studies.

B79-10516
EXTRACTING TRACE SUBSTANCES FROM BIOLOGICAL FLUIDS
A. ZLATKIS (Univ. of Houston)
Jun. 1980
MSC-18522 **Vol. 4, No. 4, p. 516**

Apparatus is used as aid in extraction of trace amounts of volatile organics from biological fluids. 'Transervaporator' makes it possible to prepare violate fraction for analysis by high-resolution gas chromatography.

B79-10517
MONITORING FETAL PH BY TELEMETRY
A. BLUM, T. DONAHOE, M. D. JHABVALA, and W. RYAN
Jun. 1980
GSFC-12507 **Vol. 4, No. 4, p. 517**

Telemetry unit has been developed for possible use in measuring scalp-tissue pH and heart rate of unborn infant. Unit radius data to receiver as much as 50 ft. away. Application exists during hours just prior to childbirth to give warning of problems that might require cesarean delivery.

B79-10518
TRIFUNCTIONAL TRANSDUCER FOR MYOCARDIAL MONITORING
V. H. CULLER (Caltech), C. FELDSTEIN (Caltech), G. W. LEWIS (Caltech), and S. MEERBAUM (Sinai Medical Center)
Jun. 1980
NPO-14329 **Vol. 4, No. 4, p. 517**

Prototype myocardial transducer simultaneously monitors internal force, displacement, and thickness of heart muscle fiber within localized area of heart muscle. Transducer can be placed in area less than 1.5 by 4 mm.

06 MECHANICS

B79-10086
CONTAINERLESS HIGH-TEMPERATURE CALORIMETER
L. L. LACY, D. B. NISEN, and M. B. ROBINSON
Aug. 1979
M-FS-23923 **Vol. 4, No. 1, p. 89**

Samples are heated by electron bombardment in high-temperature calorimeter that operates from 1,000 to 3,600 C yet consumes less that 100 watts at temperatures less than 2,500 C. Contamination of samples is kept to minimum by suspending them from wire in vacuum chamber. Various sample slopes such as wires, disks, spheres, rods, or irregular bodies can be accommodated and only about 100 nq of samples are needed for accurate measurements.

B79-10087
OBTAINING AN ELECTRICAL OUTPUT FROM A MECHANICAL FLOWMETER
W. T. POWERS

Aug. 1979
M-FS-23958 **Vol. 4, No. 1, p. 90**

Circuit using optical sensor, low power counting electronics, one clip digital-to-analog converter and operational amplifier converts mechanical readout of water, gas, fuel oil or power meter to analog signal suitable for online processing.

B79-10088
DIFFERENTIAL OIL FLOWMETER
W. T. POWERS
Aug. 1979
M-FS-23959 **Vol. 4, No. 1, p. 91**

Difference in oil flow volume through two mechanical flowmeters is converted to analog signal by simple inexpensive circuit. Circuit can be implemented with only minor changes to conventional oil flowmeters and used to measure fuel consumed by oil fired furnace or water heater.

B79-10089
BIDIRECTIONAL FLUID-FLOW MONITOR
S. L. BARAJAS (Rockwell International Corp.)
Aug. 1979
MSC-16762 **Vol. 4, No. 1, p. 92**

Bidirectional fluid-flow monitor detects flow rates as low as 0.1 gal/min (0.41/min) and operates at temperatures up to 350 F (177 C) and at pressures to 500 psig (3.6 X 10 to the sixth power N/M squared). Monitor shows 'no flow' or 'maximum flow' conditions and approximately indicates immediate flow rates.

B79-10090
ELECTRICAL INDICATION OF AIRFLOW RATE
C. MURRISH (Life Sciences Engineering)
Aug. 1979
M-FS-23873 **Vol. 4, No. 1, p. 92**

Adaption of gas-flow measurement technique originally developed by C. C. Thomas in 1911 is used for temperature measurements which are easily converted to electrical signals.

B79-10091
NONDESTRUCTIVE PULL TESTER
A. LEVY (Hughes Aircraft Co.)
Aug. 1979
MSC-18329 **Vol. 4, No. 1, p. 93**

Quality control of welded electric wires is improved with easy-to-use tool applying small constant pull force to weldment (typically less than one-twentieth force required to pull weld apart).

B79-10092
PUSH TEST FOR SWITCH WELDS
C. J. TORBORG (Honeywell, Inc.)
Aug. 1979
M-FS-25027 **Vol. 4, No. 1, p. 94**

Pencil-like tool that applies low predetermined force, may be used to individually test switch welds for identification of poor or marginal welds without harming good ones.

B79-10093
CHECKING WELD PENETRATION
D. I. MACFARLANE (Rockwell International Corp.)
Aug. 1979
M-FS-19395 **Vol. 4, No. 1, p. 95**

Fused wire in weld root area verifies weld penetration in electron-beam-welded joints. Method could be used in automotive, aircraft, and machinery manufacturing when electron-beam-welds cannot be inspected ultrasonically.

B79-10094
ULTRASONIC GRATING CHECKS ELECTRON-BEAM WELDS
H. A. MITCHELL (Rockwell International Corp.)
Aug. 1979
M-FS-19422 **Vol. 4, No. 1, p. 95**

Remote inspection technique uses reflectance of ultrasonic waves from machined steps in root area of electron beam welds to indicate sound or faulty welds.

B79-10095
ACCURATE MEASUREMENTS OF MASS AND CENTER OF MASS
E. Y. CHOW and M. R. TRUBERT
Aug. 1979 See also NASA-CR-156130 (N78-20177)
NPO-14428 **Vol. 4, No. 1, p. 96**

Object is measured for mass and center of mass with accuracies of 0.01% and 0.14% respectively, using method that eliminates errors in alignment, leveling, and calibration. Method is applied to scientific instruments, recorder turntables, flywheels, and other devices that require precise balancing.

B79-10096
MEASURING RESISTANCE OR CONDUCTANCE OF INSULATORS
H. S. MAY (Rockwell International Corp.)
Aug. 1979
MSC-18132 **Vol. 4, No. 1, p. 98**

Device protects stable fixture for holding electrodes against specimen conductance or resistance measurement with substantially less labor and expense than previous methods.

B79-10097
LASER ALIGNMENT OF LARGE ASSEMBLIES
W. S. CAZARES (Rockwell International Corp.) and D. D. KERN (Rockwell Interational Corp.)
Aug. 1979
MSC-19346 **Vol. 4, No. 1, p. 99**

Electronically leveled laser instrument, incorporating special tiltmeter-controlled laser alignment transit, simplifies alignment of large structure. System operated from single alignment reference tower saves time and costs in assembling of structures.

B79-10098
MEASURING THE THICKNESS OF PLASTIC FILMS
K. C. DONOHOE and T. WYDEVEN, JR.
Aug. 1979
ARC-11219 **Vol. 4, No. 1, p. 100**

Optical instrument measures thickness of translucent and transparent sheets in thickness range from 2 to 8 microns by monitoring attenuation of light as it passes through sheet.

B79-10099
TROUBLESHOOTING PLATED-WIRE MEMORIES
C. M. BAKER (Honeywell, Inc.), T. M. BRIGHT (Honeywell, Inc.), and R. C. CONSTABLE (Honeywell, Inc.)
Aug. 1979
M-FS-23903 **Vol. 4, No. 1, p. 100**

Faults in plated wire memories are identified and located from outside of system by applying electrical impulses and analyzing their reflectance in technique of Time-Domain Reflectometry (TDR). Intermittent faults are easier to find because memory system is not disturbed by probing or disassembly.

B79-10100
DETERMINATION OF TOTAL SURFACE REFLECTIVITY
D. J. DESMET (Univ. of Alabama), A. J. JASON (Univ. of Alabama), and A. C. PARR (Univ. of Alabama)
Aug. 1979
M-FS-25024 **Vol. 4, No. 1, p. 102**

Method of measuring total reflectance employs relatively inexpensive reflectometer with gold-coated hemispherical reflector. Light sources may be tungsten lamp for visible region, or Globar lamp for infrared.

B79-10101
CHARACTERIZING GLASS FRITS FOR SLURRIES
H. N. NAKANO (Lockheed Missiles and Space Co.)
Aug. 1979
MSC-18322 **Vol. 4, No. 1, p. 103**

Glass frit can be mixed with consistently reproducible properties even from different batches of glass frit using technique to measure one quantity that determines integrated properties of frit for combination with given liquid.

B79-10102
TEST-CONFIGURATION IDENTIFIERS
W. D. SUMRALL (IBM Corp.)
Aug. 1979
KSC-11087 **Vol. 4, No. 1, p 103**

Distributed computer system, which allows great deal of interaction within totally synchronized environment, comprises test system that presents systematic approach for identifying test configurations for large complex systems such as submarines, aircraft, or air traffic controllers.

B79-10103
ANTITHEFT CONTAINER FOR INSTRUMENTS
J. J. KERLEY, JR.
Aug. 1979
GSFC-12399 **Vol. 4, No. 1, p. 104**

Antitheft container is used to prevent theft of calculators, portable computers, and other small instruments. Container design is simple and flexible enough to allow easy access to display or input systems of instruments, while not interfering with power input to device.

B79-10104
EXTENDING THE RANGE OF LEAK DETECTORS
M. E. BURR (Rockwell International Corp.)
Aug. 1979
M-FS-19411 **Vol. 4, No. 1, p. 105**

Pressure-gage calibration, mass-spectrometer leak detector measures leakage rates up to 300 times greater than its normal limit. Approach utilizes constant-volume displacement characteristic of mechanical vacuum pump. Vacuum system must be small for calibration measurement validity and reduction of outgassing.

B79-10105
ATTACHING STRAIN TRANSDUCERS TO FRAGILE MATERIALS
M. F. DUGGAN (Lockheed Missiles and Space Co.)
Aug. 1979
MSC-16580 **Vol. 4, No. 1, p. 106**

A-shaped clamp prevents damage to thin, brittle specimens and supports displacement transducer away from heated zone. Also it defines reference points for strain measurement on specimen surface thus preventing specimen cracking due to unequal thermal expansion between clamp and holder.

B79-10106
AUDIBLE MONITOR FOR ELECTROPLATING
E. A. BUROWICK (Rockwell International Corp.)
Aug. 1979
M-FS-19333 **Vol. 4, No. 1, p. 106**

'No buzzer' indicates early problem in electroplating when parts are properly immersed into electroplating bath. Buzzer sounds when current flows through part; however, if current is cut, buzzer stops warning that parts must be removed and refinished thus preventing unnecessary waste of electrical energy and labor.

B79-10107
INSPECTING CRACKS IN FOAM INSULATION
L. W. CAMBELL (Martin Marietta Corp.) and G. K. JUNG
Aug. 1979
M-FS-23799 **Vol. 4, No. 1, p. 107**

Dye solution indicates extent of cracking by penetrating crack and showing original crack depth clearly. Solution comprised of methylene blue in denatured ethyl alcohol penetrates cracks completely and evaporates quickly and is suitable technique for usage in environmental or structural tests.

B79-10108
MEASURING INSULATION THICKNESS
D. M. MUNN (Martin Marietta Corp.)
Aug. 1979
M-FS-23798 **Vol. 4, No. 1, p. 108**

Calibrated eddy-current meter measures thickness of thermal insulation on metal substrates with specially designed adapters; for example, thickness of fiberglass parts for boats or automobiles. Technique is particularly useful for sprayed-on insulation.

B79-10109
BURN-TEST APPARATUS FOR FIBER COMPOSITES
W. L. DOWLER, J. D. QUINN, K. N. RAMOHALLI, and D. E. UDLOCK
Aug. 1979
NPO-14578 **Vol. 4, No. 1, p. 109**

Burn-test apparatus made from conductive metal grid and indicator lamp monitors release of conductive carbon fibers from specimen of carbon-reinforced composites exposed to flame. Procedure is more sensitive than photographing or physically trapping and counting fibers.

B79-10110
MEASURING MOISTURE IN THE ATMOSPHERE
D. L. JOHNSON
Aug. 1979 See also NASA-TM-78190 (N78-31405)
M-FS-25032 **Vol. 4, No. 1, p. 110**

Report describes instruments for measuring moisture in air by categorizing instruments according to their thermodynamic, hygroscopic, condensation, absorption, diffusion, and optical properties.

B79-10111
FRICTION COEFFICIENTS OF PTFE BEARING LINER
C. M. DANIELS (Rockwell International Corp.)
Aug. 1979
M-FS-19389 **Vol. 4, No. 1, p. 110**

Data discusses frictional characteristics of PTFE (polytetrafluoroethylene) under temperature extremes and in vacuum environment. Tests were also run on reduced scale hardware to determine effects of vacuum. Data is used as reference by designers of aircraft-control system rod-end bearings and for bearings used in polar regions.

B79-10112
AIRCRAFT MISSION ANALYSIS
D. S. HAUGE (Aerophysics Research Center) and H. L. ROSENDAAL (Aerophysics Research Center)
Aug. 1979
LANGLEY-12299 **Vol. 4, No. 1, p. 110**

Aircraft missions, from low to hypersonic speeds, are analyzed rapidly using the FORTRAN IV program NSEG. Program employs approximate equations of motion that vary in form with type of flight segment. Takeoffs, accelerations, climbs, cruises, descents, decelerations, and landings are considered.

B79-10113
DYNAMIC SIMULATION AND STABILITY ANALYSIS
H. P. FRISCH
Aug. 1979
GSFC-12422 **Vol. 4, No. 1, p. 111**

Dynamic Interaction Simulation of Controls and Structure (DISCOS) program was developed for dynamic simulation and stability analysis of passive and actively controlled spacecraft. Program is written in FORTRAN IV for batch execution and requires access to finite-element structures program as NASTRAN for flexible-body input data.

B79-10114
GODDARD TRAJECTORY DETERMINATION
B. DIXON
Aug. 1979
GSFC-11946 **Vol. 4, No. 1, p. 112**

Goddard Trajectory Determination System (GTDS), programs designed to support Earth, lunar and interplanetary missions are used as research and development tool. Program displays research and development used in trajectory determination, preflight and postflight analyses, simulation of tracking data, ephemeris generation, and related tasks.

B79-10115
MINICOMPUTER VERSION OF SPAR
O. O. STORAASLI

Aug. 1979
LANGLEY-12370; LANGLEY-12371 **Vol. 4, No. 1, p.113**
SPAR (Structural Performance Analysis and Redesign Program), powerful tool for efficiently solving finite-element structural analysis problems, has been implemented on minicomputers. System analyzes stress, buckling, vibration, and thermal loads of large linear finite-element structural models.

B79-10116
HINGE-CONNECTED RIGID BODIES
C. E. FLEISCHER and P. W. LIKINS
Aug. 1979
NPO-11964 **Vol. 4, No. 1, p. 113**
Package of subroutines solve minimum dimension sets of discrete coordinate equations of motion for arbitrary number of hinge-connected rigid bodies assembled in tree topology.

B79-10117
CENTROIDS, MOMENTS, AND RADII OF GYRATION
R. W. PATCH
Aug. 1979
LEWIS-12765 **Vol. 4, No. 1, p. 114**
Computer program finds area, centroid, moments of inertia, product of inertia, and radii of gyration of closed curve given in graphical form such as on engineering drawing or strip chart. System is applicable when finding volume and center of gravity for liquid tanks, or for detecting buoyancy of hull sections.

B79-10236
ACCURATE DETERMINATION OF WORK IN THREE-POINT BEND TESTS
R. J. BUZZARD and D. M. FISHER
Dec. 1979 See also NASA-TM-X-73596(N77-19486)
LEWIS-13034 **Vol. 4, No. 2, p. 249**
Article presents procedure where correction curve accounts for coincidental displacement and simplifies data analysis in three point bend test in field of materials testing. Method is applicable to any test in above field regardless of load displacement.

B79-10237
IMPROVED DISPLACEMENT MEASUREMENT IN BEND TESTING
R. J. BUZZARD and D. M. FISHER
Dec. 1979 See also NASA-TM-X-73596(N77-19486)
LEWIS-13035 **Vol. 4, No. 2, p. 250**
Removable spacers extend displacement range and increase accuracy. Innovation is needed to accurately measure displacement between ram and load applicator of compression testing machine during bend testing.

B79-10238
DISPLACEMENT GAGE MODIFIED FOR MULTIPLE MEASUREMENTS
R. J. BUZZARD and D. M. FISHER
Dec. 1979 See also NASA-TM-73731(N77-30500)
LEWIS-13036 **Vol. 4, No. 2, p. 251**
Clip-in gages used in fracture toughness testing are modified to permit acquisition of additional displacement data. With innovation, displacement is measured simultaneously at several locations on face of test specimen.

B79-10239
MEASURING THE PERMITTIVITY OF GASES AND AEROSOLS
W. J. TRETT
Dec. 1979
KSC-11090 **Vol. 4, No. 2, p. 252**
Two-coupler microwave technique measures complex permittivity utilizing waveguide which encloses gas or aerosol. Using technique, blower continuously circulates substances to keep them homogeneous.

B79-10240
IMPROVED SPLIT-FILM VECTOR ANEMOMETER
J. SCHEIMAN
Dec. 1979
LANGLEY-12391 **Vol. 4, No. 2, p. 253**
Split-film vector anemometer accurately measures magnitude and direction of fluid flow velocity in three-dimensional space using only one of three split films in three-prong split-film system. With procedure, one sensor develops all data previously required by three.

B79-10241
TESTING PANELS IN SHEAR AND BIAXIAL COMPRESSION
J. K. NEARY (Rockwell International Corp.)
Dec. 1979
MSC-16132 **Vol. 4, No. 2, p. 254**
Hydraulic jacks simultaneously apply torsion, axial compression, and lateral compression to structural panels. Jacks are suitable for testing large panels used in aircraft, lightweight trucks, and buses.

B79-10242
PREDICTING THE WET STRENGTH OF LAMINATES
R. E. BOHLMAN (McDonnell Douglas Corp.)
Dec. 1979
MSC-18022 **Vol. 4, No. 2, p. 255**
Graphite/epoxy strengths at various moisture contents are estimated by extrapolating from small data base. With procedure, massive testing is unnecessary because advantage is taken of large data base already available for moisture content in laminates.

B79-10243
NONCONTACT STRAIN MEASUREMENT
P. T. BIZON and F. D. CALFO
Dec. 1979 See also NASA-TM-73886(N78-19161)
LEWIS-13091 **Vol. 4, No. 2, p. 256**
Electro-optical extensometer containing optical and electronic components measures displacement in simulated turbine blade thermally cycled into and out of hot-gas stream. Innovation is useful in obtaining accurate strain histories for components subjected to severe thermal environments and other environmental changes.

B79-10244
THERMOGRAPHIC INSPECTION OF WELDED CONTACTS
G. L. WORKMAN (North Alabama Scientific & Engineering Consultants, Inc.)
Dec. 1979
M-FS-25093 **Vol. 4, No. 2, p. 257**
Good and poor-quality welds are identified by digitized thermography, an approach which improves reliability of solar arrays on space probes.

B79-10245
NONDESTRUCTIVE WELD TEST BY HOLOGRAPHY
M. PERRY (North Alabama Scientific & Engineering Consultants, Inc.) and G. L. WORKMAN (North Alabama Scientific & Engineering Consultants, Inc.)
Dec. 1979
M-FS-23826 **Vol. 4, No. 2, p. 258**
Hologram with magnification locates poorly bonded pads on solar cell arrays. Innovation is useful for testing assembly of large solar-cell arrays accurately and nondestructively.

B79-10246
DIAZO TECHNIQUES FOR REMOTE SENSOR DATA ANALYSIS
S. MOUNT (Missouri Univ. - Rolla) and L. E. WHITEBAY (Missouri Univ. - Rolla)
Dec. 1979 See also NASA-CR-2953(N78-17447)
M-FS-25110 **Vol. 4, No. 2, p. 259**
Cost and time to extract land use maps, natural-resource surveys, and other data from aerial and satellite photographs are reduced by diazo processing. Process can be controlled to enhance features such as vegetation, land boundaries, and bodies of water.

B79-10247
A THERMOCOUPLE FOR HOT, OXIDIZING ENVIRONMENTS
R. V. JENKINS

Dec. 1979
LANGLEY-12229 **Vol. 4, No. 2, p. 260**
Thermocouple enclosed in nonoxidizing thermally conductive metal provides temperature probe which is made for very hot, highly oxidizing environments. Approach makes temperature measurement in hot, oxidizing atmospheres much easier task.

B79-10248
AIRPLANE STABILITY PROGRAMS FOR POCKET CALCULATORS
W. L. SHERMAN
Dec. 1979 See also NASA-TM-78678(N78-30138)
LANGLEY-12479 **Vol. 4, No. 2, p. 261**
Three general-use programs and three stability programs are written for pocket calculators.

B79-10249
CONTROLLING A WIDE RANGE OF FLOW RATES
G. S. PERKINS (Caltech)
Dec. 1979
NPO-14312 **Vol. 4, No. 2, p. 262**
Servo-operated valve and two flowmeters allow accurate control over 1,900:1 flow-rate range. It was developed as part of laboratory instrument for measuring properties of confined fluids under conditions analogous to those encountered in deep drilling operations.

B79-10250
NONINTERFERING SUPPORT FOR AERODYNAMIC MODELS
S. M. DOLLYHIGH, C. M. JACKSON, JR., and D. S. SHAW
Dec. 1979
LANGLEY-12441 **Vol. 4, No. 2, p. 262**
Metric half-span support increases accuracy of subsonic and supersonic wind-tunnel measurements.

B79-10251
SOLAR-POWERED JET REFRIGERATOR
V. W. CHAI (Caltech) and F. L. LANSING (Caltech)
Dec. 1979
NPO-14550 **Vol. 4, No. 2, p. 263**
Design criteria are easily evaluated by tool. Thermodynamic analysis of solar-powered vapor-jet refrigerator combines important performance parameters in nomogram that assist design of practical system. Projected coefficients of performance for different ejector configurations, working fluids, and other design variables are easily obtained from nomogram.

B79-10252
ESTIMATING EFFECTS OF ACCIDENTAL PROPELLANT EXPLOSIONS
P. M. ORDIN, W. E. BAKER (Southwest Research Center), P. K. KULESZ (Southwest Research Center), P. K. MOSELEY (Southwest Research Center), V. B. PARR (Southwest Research Center), R. E. RICKER (Southwest Research Center), L. M. VARGAS (Southwest Research Center), and P. S. WESTINE
Dec. 1979 See also NASA-CR-3023(N79-10226); NASA-CR-134906(N76-19296)
LEWIS-13247 **Vol. 4, No. 2, p. 265**
Workbook assesses magnitudes and effects of blasts and fragments from ground system explosions. It provides designer and safety engineer with rapid methods for predicting damage and hazards from explosions of liquid-propellant and compressed-gas vessels used in ground storage, transport, and handling.

B79-10253
FLOW FIELDS IN SUPERSONIC INLETS
V. L. SORENSEN
Dec. 1979
ARC-11098 **Vol. 4, No. 2, p. 265**
Flow fields in two and three dimensional axisymmetric supersonic inlets are calculated with computer program that uses method of characteristics to compute array of points in flow field. At each point, local pressure, local Mach number, local flow angle, and static pressure are calculated. Program can be used to design and analyze supersonic inlets by determining surface compression rates and throat flow properties.

B79-10254
CHARACTERISTICS OF WING/BODY/TAIL CONFIGURATIONS
M. F. E. DILLENIUS (Nielsen Engineering & Research, Inc.), F. K. GOODWIN (Nielsen Engineering & Research, Inc.), D. M. KLINE (Nielsen Engineering & Research, Inc.), and M. R. MENDENHALL (Nielsen Engineering & Research, Inc.)
Dec. 1979
ARC-11224 **Vol. 4, No. 2, p. 266**
Package of computer programs determine longitudinal aerodynamic characteristics of wing/body/tail combinations including effects of nonlinear aerodynamics of components and interference between components.

B79-10255
ADVANCED-PANEL PILOT CODE
G. R. BILLS (Boeing Commercial Airplane Co.), M. A. EPTON (Boeing Commercial Airplane Co.), and F. T. JOHNSON (Boeing Commercial Airplane Co.)
Dec. 1979
ARC-11278 **Vol. 4, No. 2, p. 266**
Numerical research program helps establish 'proof-of-concept' for newly developed higher-order panel method applicable to both subsonic and supersonic flows about nearly-arbitrary aircraft configurations. It is intended to solve variety of boundary-value problems in steady-subsonic or supersonic inviscid flow.

B79-10256
ARBITRARY AIRCRAFT-GEOMETRY GENERATOR
C. L. W. EDWARDS, W. J. SMALL, and S. H. STACK
Dec. 1979
LANGLEY-12515 **Vol. 4, No. 2, p. 267**
Computer program helps designers to generate detailed configuration geometry with much flexibility in choices of configurations and details of description. Input requirements, program turnaround time, and costs are kept low. It consists of routines that generate fuselage and planar-surface (winglike) geometries and routine that determines true intersection of all components with fuselage.

B79-10257
RELIABILITY OF NONDESTRUCTIVE EVALUATION DATA
J. C. COUCHMAN (General Dynamics Corp.) and B. G. W. YEE (General Dynamics Corp.)
Dec. 1979
LEWIS-12908 **Vol. 4, No. 2, p. 267**
Program calculates probability of defects at selected confidence levels from nondestructive evaluation data. It provides alternate method of grouping sample data to obtain reasonable value for lower confidence limit with small sample size.

B79-10378
IMPROVED FLAW-DETECTION METHOD
R. J. PLATT, JR.
Apr. 1980
LANGLEY-11866 **Vol. 4, No. 3, p. 397**
Holographic detection of unbonded or delaminated surfaces of materials and structures is improved by using helium instead of air in vacuum test chamber. Helium has index of refraction closer to vacuum (unity) than air. Therefore changes in chamber pressure during test do not alter index of refraction as much as they do with air. With air, much of detail is lost, particularly in curved areas.

B79-10379
SOLAR-CELL DEFECT ANALYZER
M. K. GAUTHIER (Caltech), E. L. MILLER (Caltech), and A. SHUMKA (Caltech)
Apr. 1980
NPO-14476 **Vol. 4, No. 3, p. 398**
Laser-Scanning System pinpoints imperfections in solar cells. Entire solar panels containing large numbers of cells can be scanned. Although technique is similar to use of scanning electron microscope (SEM) to locate microscopic imperfections, it differs in that large areas may be examined, including entire

solar panels, and it is not necessary to remove cover glass or encapsulants.

B79-10380
DETECTING LEAKS IN VACUUM BAGS
E. E. CARLSTROM (Lockheed Missiles and Space Co., Inc.)
Apr. 1980
MSC-18423 **Vol. 4, No. 3, p. 399**
Small leaks in vacuum bag can be readily detected by eye, using simple chemical reaction: combination of ammonia and acetic acid vapors to produce cloudy white smoke. Technique has been successfully used to test seam integrity and to identify minute pinholes in vacuum bag used in assembly of ceramic-tile heat shield for Space Shuttle Orbiter.

B79-10381
CRACK-OPENING DISPLACEMENT TRANSDUCER
R. A. SIMONDS (Vought Corp.)
Apr. 1980
LANGLEY-12485 **Vol. 4, No. 3, p. 400**
Crack-opening displacement transducer consists of 30 deg cone, coil spring, and linear-displacement transducer. Conical probe is used to measure crack opening. Cone is pressed firmly into crack by spring. As applied load causes crack to open up, cone is pushed further into it. Movement of cone, and thus crack growth, is monitored by linear-displacement transducer. Method gives more accurate measurement of crack-opening displacement of very narrow slots.

B79-10382
PEEL TESTING METALIZED FILMS
L. BIVINS (Rockwell International Corp.) and T. SMITH (Rockwell International Corp.)
Apr. 1980
NPO-14672 **Vol. 4, No. 3, p. 401**
Flimsy ultrathin sheets are mounted on glass for peel-strength measurements. Technique makes it easier to perform peel tests on metalized plastic films. Technique was developed for determining peel strength of thin (1,000 A) layers of aluminum on Kapton film. Previously, material has been difficult to test because it is flimsy and tends to curl up and blow away at slightest disturbance. Procedure can be used to measure effects on metalization bond strength of handling, humidity, sunlight, and heat.

B79-10383
GAGE FOR 3-D CONTOURS
C. C. HAYNIE (Rockwell International Corp.)
Apr. 1980
MSC-19589 **Vol. 4, No. 3, p. 402**
Simple gage, used with template, can help inspectors determine whether three dimensional curved surface has correct contour. Gage was developed as aid in explosive forming of Space Shuttle emergency-escape hatch. For even greater accuracy, wedge can be made of metal and calibrated by indexing machine.

B79-10384
AUTOMATIC INSPECTION OF SILICON WAFERS
M. MARTIN (TAI, Inc.)
Apr. 1980
M-FS-25124 **Vol. 4, No. 3, p. 403**
Laser machine scans wafers for contaminating particles which cause open circuits, short circuits, and other defects in integrated circuits and transfers good wafers to integrated circuit processing equipment. Machine is faster and more accurate than human operator using lightfield/dark field microscope.

B79-10385
FAIRED INSTRUMENTATION FOR AERODYNAMIC TESTS
W. C. LONG and M. L. WILLIAMS
Apr. 1980
LANGLEY-11201 **Vol. 4, No. 3, p. 404**
Streamlined package is installed and removed without altering aerodynamic properties of structure being tested. Method uses lightweight materials so that blade balance is maintained.

B79-10386
DEFLECTOMETER FOR PRECRACKED CHARPY AND JIC BEND TESTS
R. T. BUBSEY and M. H. JONES
Apr. 1980
LEWIS-13090 **Vol. 4, No. 3, p. 404**
Deflectometer uses ASTM Standard Test E-399 clip-in displacement gage as sensing element. Gage is available in most fracture testing laboratories and has good sensitivity and accuracy.

B79-10387
ZONE-CONTROLLED RESISTANCE HEATER
P. R. BAGWELL (Vought Corp.)
Apr. 1980
MSC-16251 **Vol. 4, No. 3, p. 406**
Geodesic array of heaters powered by separate electrical supply unit and silicon controlled-rectifier (SCR) control unit produces controlled temperatures over independent zones. Arrays conform to and enclose almost any shape with close thermal coupling and are programmed to reproduce almost any desired time/temperature distribution.

B79-10388
ENERGY SAVER FOR INDUSTRIAL LIGHTING
J. ARLINE (Warren and Williams Associates, Inc.), J. LAPALME (Warren and Williams Associates, Inc.), and C. WARREN (Warren and Williams Associates, Inc.)
Apr. 1980
KSC-11103 **Vol. 4, No. 3, p. 407**
Electronic controller switches lights on or off in response to amount of sunlight available. Is applicable in offices and industrial installations where electrical energy is wasted by using artificial light in sunlit areas. Device utilizes electronic monitor that varies artificial lighting according to amount of sunlight in given area.

B79-10389
COMPACT THERMOCOUPLE REFERENCE FOR VACUUM CHAMBERS
J. C. FAY (Rockwell International Corp.) and J. D. GLOVER (Rockwell International Corp.)
Apr. 1980
MSC-19651 **Vol. 4, No. 3, p. 408**
Self-contained reference installed inside vacuum chamber include its own heater and power controller. Setup is less costly than approach utilizing many thermocouples.

B79-10390
FIBER-OPTIC PROXIMITY SENSOR
A. K. BEJCZY (Caltech), W. A. HERMANN (Caltech), and H. C. PRIMUS (Caltech)
Apr. 1980
NPO-14653 **Vol. 4, No. 3, p. 408**
Proximity sensor for mechanical hand of remote manipulator incorporates fiber optics to conduct signals between light source and light detector. Fiber optics are not prone to noise from electromagnetic interference and radio-frequency interference as are sensors using long electrical cables.

B79-10391
SAFETY SHIELD FOR VACUUM/PRESSURE-CHAMBER WINDOWS
R. A. SHIMANSKY and R. SPENCER
Apr. 1980
GSFC-12513 **Vol. 4, No. 3, p. 409**
Optically-clear shatter-resistant safety shield protects workers from implosion and explosion of vacuum and pressure windows. Plastic shield is inexpensive and may be added to vacuum chambers, pressure chambers, and gas-filling systems.

B79-10392
LIGHTNING PROTECTION FOR AIRCRAFT
F. A. FISHER (General Electric Co.) and J. A. PLUMER (Lightning Technologies, Inc.)
Apr. 1980 See also NASA-RP-1008 (N78-11024)
LEWIS-12981 **Vol. 4, No. 3, p. 410**

Reference book summarizes current knowledge concerning potential lightning effects on aircraft and means available to designers and operators to protect against effects. Book is available because of increasing use of nonmetallic materials in aircraft structural components and use of electronic equipment for control of critical flight operations and navigation.

B79-10393
FAN NOISE-MODE STRUCTURE IN A DUCT
R. A. LOVE (Pratt and Whitney Aircraft Group), G. F. PICKETT (Pratt and Whitney Aircraft Group), and R. A. WELLS (Pratt and Whitney Aircraft Group)
Apr. 1980 See also NASA-CR-135295 (N78-17066); NASA-CR-135294 (N78-17065); NASA-CR-135293 (N78-17064)
LEWIS-13129 **Vol. 4, No. 3, p. 411**
Two computer programs help analyst meet low-noise limits on turbofan engines. Microphone Location Program computes optimum locations in turbofan duct for placement of microphones. After tests in first program are run, acoustic phase, amplitude, and pressure are used as inputs in Modal Calculation Program.

B79-10394
ELECTRIC-CAR SIMULATION
C. P. CHAPMAN (Caltech) and R. A. SLUSSER (Caltech)
Apr. 1980
NPO-14570 **Vol. 4, No. 3, p. 411**
PARAMET, interactive simulation program for parametric studies of electric vehicles, guides user through simulation by menu and series of prompts for input parameters. Program considers aerodynamic drag, rolling resistance, linear and rotational acceleration, and road gradient as forces acting on vehicle.

B79-10395
PHASE CHANGES IN LIQUID FACE SEALS
W. F. HUGHES (Carnegie-Mellon Univ.)
Apr. 1980
LEWIS-12994 **Vol. 4, No. 3, p. 412**
Computer program predicts boiling (phase change) in liquid face seals. Program determines if and when boiling occurs, and calculates location of boiling interface, pressure and temperature profiles, and load.

B79-10396
COUPLED-CAVITY TRAVELING-WAVE TUBES
D. J. CONNOLLY and T. A. OMALLEY
Apr. 1980
LEWIS-12861 **Vol. 4, No. 3, p. 412**
Computer program is developed for analysis of coupled cavity traveling waves tubes (TWT's) which are used in variety of radar and communications applications. Programmers can simulate tubes of arbitrary complexity such as input and output couplers and other features peculiar to one or few cavities which may be modeled by correct choices of input data.

B79-10397
NATURAL MODES OF HELICOPTER ROTOR BLADES
R. E. MINECK (U.S. Army R&T Labs.) and W. H. WELLER (U.S. Army R&T Labs.)
Apr. 1980
LANGLEY-12501 **Vol. 4, No. 3, p. 413**
Computer program based on Holzer-Myklestad approach calculates coupled vertical, horizontal, and torsional characteristics of wide variety of hub and blade configurations of practical interest. Program is written in FORTRAN IV.

B79-10398
INTERFERING SURFACES IN SUBSONIC, TRANSONIC, AND SUPERSONIC FLOW
A. M. CUNNINGHAM, JR. (General Dynamics Corp.)
Apr. 1980
LANGLEY-12524 **Vol. 4, No. 3, p. 413**
Computer program provides analysis method based on kernel-function technique that uses assumed pressure functions with unknown coefficients. With technique, generalized forces are calculated in unsteady flow, and pressure distributions are obtained in steady and unsteady flow.

B79-10399
LOW-ASPECT-RATIO WINGS
C. E. LAN (Univ. of Kansas Center for Research, Inc.) and S. C. MEHROTRA (Univ. of Kansas Center for Research, Inc.)
Apr. 1980
LANGLEY-12490 **Vol. 4, No. 3, p. 414**
Computer program predicts aerodynamic characteristics of wings having attached flow across part of wing and vortex flow across remainder. Program also uses quasi-vortex lattice method to formulate wing boundary conditions.

B79-10519
TRIPLE-EXPOSURE HOLOGRAPHY FOR MATERIALS TESTS
H. K. LIU (Lumin, Inc.)
Jun. 1980
M-FS-25180 **Vol. 4, No. 4, p. 521**
Theoretical analysis of technique of triple exposure of holographic nondestructive testing shows that significant information can be extracted improving analysis of fringe pattern.

B79-10520
RESONANT-FATIGUE CRACKING APPARATUS
J. P. DORNER, W. S. PIERCE, and J. L. SHANNON, JR.
Jun. 1980
LEWIS-13037 **Vol. 4, No. 4, p. 522**
Apparatus produces controlled surface cracks in test specimens. It has been developed and is useful in production of surface cracks of controlled size and shape in fracutre specimens. It consists of specially-designed stand-mounted clamping fixture, commercially available pneumatic actuator, and suitable sound-control mufflers.

B79-10521
MEASURING ACOUSTIC PROPERTIES OF MATERIALS AND JET NOZZLES
P. D. DEAN (Lockheed Aircraft Corp.), H. E. PLUMBLEE (Lockheed Aircraft Corp.), and M. SALIKUDDIN (Lockheed Aircraft Corp.)
Jun. 1980
LEWIS-13265 **Vol. 4, No. 4, p. 523**
Method measures acoustic properties of sound-absorbent materials and jet-nozzle system. Advantages of impulse method over other methods are that test time and complication are reduced. Results obtained from impulse method have been compared with those from existing methods, both experimental and theoretical, and show excellent agreement.

B79-10522
TIRE-PRESSURE MEASURING CONCEPT
L. O. ASHMORE (Rockwell International Corp.)
Jun. 1980
MSC-18490 **Vol. 4, No. 4, p. 524**
External tire-pressure measuring concept involves device that applies external load to tire wall to measure its internal pressure. Method promises to be faster than conventional tire-pressure checks, speeding up turnaround time for aircraft. Method prevents air leakage that occurs when pressure is measured through tire valve. Device is used to measure tire pressures on land vehicles.

B79-10523
SYNTHETIC SEAWATER AS STRESS-CORROSION TEST MEDIUM
T. S. HUMPHRIES and E. E. NELSON
Jun. 1980 See also NASA-TM-X-64733(N73-22062)
M-FS-22706 **Vol. 4, No. 4, p. 525**
Seawater minimizes pitting corrosion of aluminum-alloy test samples. Of three corrosion-inhibiting methods evaluated using (a) chromate inhibitors in saltwater, (b) surface treating sample via anodizing or alodine treatment, and (c) synthetic seawater, synthetic seawater was most effective test medium, since it is more uniform than fresh seawater.

B79-10524
DETECTING INSULATION DEFECTS IN METAL/PLASTIC FILMS
R. N. BUGGLE (Honeywell, Inc.)
Jun. 1980

M-FS-25127 **Vol. 4, No. 4, p. 526**

Simple apparatus checks insulation between plastic and metal surfaces. Film can be inspected more accurately; apparatus can spot minute electrical contaminants between plastic and metal films. Steel roller connected to high-range ohmmeter is guided over entire plastic area of test sample. Roller weighs 2 lbs.(0.9 kg), which effectively translates into 250-psi (1.76X10 to 6th power -N/sq m) contact pressure at plastic surface sufficient to locate microscopic defects.

B79-10525
ACOUSTICAL MEASUREMENT SEPARATES CORE NOISE AND JET NOISE
S. P. PARTHASARATHY (Caltech)
Jun. 1980
NPO-14698 **Vol. 4, No. 4, p. 526**

Measuring technique discriminates between jet noise and core noise of jet engine. Results of experimentation confirmed that core noise and jet noise can be separated by examining cross-correlation of far-field microphone signals and that crossover point between core noise and jet noise moves toward higher velocities at higher angles with respect to jet axis.

B79-10526
ONSITE TESTING OF PRESSURE SAMPLING
R. MALLORY (Wyle Laboratories)
Jun. 1980
LANGLEY-12428 **Vol. 4, No. 4, p. 527**

Portable test instrument containing controller, pressure port identification, 5-V power source for transducer excitation, and digital voltmeter to test pressure sampling valves completely, including leak and plug check before, during, or after installation in any location or environment. Controller comprises 117/24-Vac 100-watt transformer, bridge rectifier, capacitive-discharge stepper, and constant voltage source for homing sampling valve. It also includes 5-V regulated power supply and bipolar digital voltmeter having 10-uV resolution.

B79-10527
GRAPHITE/EPOXY-TAPE TEST SPECIMENS
J. L. CUPP (Rockwell International Corp.) and F. S. SPEARS (Rockwell International Corp.)
Jun. 1980
MSC-18495 **Vol. 4, No. 4, p. 528**

Constructed specimens for tranverse tensile testing of unidirectional graphite/epoxy tape is tested more accurately than earlier samples. Specimens are made using unsupported adhesive and commercially-available (e.g., Nomex, or equivalent) honeycomb core. Flexible adhesive and dimensionally stable core eliminate uneven thermal expansion. Tensile strength of tape at various temperatures becomes direct function of applied mechanical stress.

B79-10528
'THREE-DIMENSIONAL' VIBRATION FIXTURE
C. A. SCHUMACHER (Martin Marietta Corp.)
Jun. 1980
MSC-16305 **Vol. 4, No. 4, p. 529**

Simple cube-shaped fixture reduces vibration-test time to one-third required previously. Three units are supported at once. During one run each unit is tested along one of axes. Units are repositioned on second run for tests along different axes. Three runs complete test; fixture can be set up to test small, lightweight high-production units.

B79-10529
RAPID TESTING OF PULSE TRANSFORMERS
J. GRILLO (Singer Co.)
Jun. 1980
MSC-18202 **Vol. 4, No. 4, p. 529**

Quality-control testing of pulse transformers is speeded up by method for determining rise time and droop. Instead of using oscilloscope and square-wave generator to measure these characteristics directly, method uses voltmeter and sine-wave generator to measure them indirectly in about one-tenth time. Droop and rise time are determined by measuring input/output voltage ratio at just four frequencies.

B79-10530
DETECTOR VERIFIER FOR CIRCUIT ANALYZERS
D. L. POPE (Rockwell International Corp.) and R. L. WOOTERS (Rockwell International Corp.)
Jun. 1980
MSC-19669 **Vol. 4, No. 4, p 530**

Economical tool checks operation of automatic circuit analyzer. Each loop is addressed directly from analyzer console by switching internal analyzer bridge to resistance equal that of connecting cable plus specified limiting test value. Procedure verifies whether detected faults in circuit under test are actually due to analyzer malfunction. Standard-length universal test cables make it possible to shift detector tool from cable to cable without resistance compensation.

B79-10531
RUGGED FAST-RESPONSE TEMPERATURE PROBE
P. L. BAILEY, F. R. LEMOS, and W. C. ROSE
Jun. 1980
ARC-11289 **Vol. 4, No. 4, p. 531**

Very-sensitive probe uses tungsten sensor wire wrapped around to notched electrodes. Design combines ruggedness of earlier but less sensitive probe using very-short sensor wire with very-sensitive but fragile version with sensor wires wrapped around non-conducting frames.

B79-10532
HIGH-TEMPERATURE HIGH-PRESSURE MAGNETIC PICKUP
L. A. AHLBERG (Rockwell International Corp.) and B. R. TITTMANN (Rockwell International Corp.)
Jun. 1980
MSC-18389 **Vol. 4, No. 4, p. 532**

Magnetic-pickup transducers operate at temperature as high as 1,100 C and pressures in excess of 2.5 kilobars. Transducers obtain simulated seismic data in laboratory experiments at high temperatures and pressure. They also have potential applications in industrial instrumentation for measurements under similarly difficult conditions. Transducers use high-temperature cement to bond parts together and high-temperature-insulated copper or aluminum wire for windings.

B79-10533
CONTROLLING SUBSYNCHRONOUS WHIRL IN TURBOPUMPS
M. D. BLACK (Rockwell International Corp.) and B. F. ROWAN (Rockwell International Corp.)
Jun. 1980
M-FS-19423 **Vol. 4, No. 4, p. 533**

Active fluidic dampers are proposed for controlling turbopump-shaft whirl. Study indicates that linear variable-bleed detector and linear bistable amplifier are effective in supplying sizable controlled damping forces. Linear bistable device was considered as simplest and most adequate.

B79-10534
MECHANICAL-LOAD INDICATOR
W. T. APPLEBERRY (Rockwell International Corp.)
Jun. 1980
MSC-19511 **Vol. 4, No. 4, p. 534**

By rotation of washerlike part, mechanical indicator shows when predetermined compression or tension load has been reached. Indicator consists of bolt, sleeve, load-indicating washer, and nut. Besides application as load indicator, device has uses as remote indicator of mechanical action. Rotating washer can also act as sequencer, signaling action to begin upon attainment of certain load. It can be used, for example, to initiate work cycle after stored energy has been built up in hydraulic or pneumatic power equipment. It can also be used as remote, nonelectrical switch in hazardous environments.

B79-10535
ADJUSTABLE HOLDER FOR TRANSDUCER MOUNTING
R. C. DEOTSCH (Rockwell International Corp.)
Jun. 1980
MSC-18371 **Vol. 4, No. 4, p. 535**

Positioning of acoustic sensor, strain gage, or similar transducer is facilitated by adjustable holder. Developed for installation on Space Shuttle, it includes springs for maintaining uniform load on transducer with adjustable threaded cap for precisely controlling position of sensor with respect to surrounding structure.

B79-10536
AN EVALUATION OF LOW-COST PAYLOAD CARRIER
V. H. YOST
Jun. 1980
M-FS-25129 **Vol. 4, No. 4, p. 536**

Payload carrier designed for space vehicles is essentially cargo carrier that supports, positions, and protects various equipment and materials used in conducting experiments in weightless space environment. Proposed carrier entitled Materials Experiment Assembly II (MEA-II) is considered superior to previously developed models in size, weight, and cost to user. Structure is lightweight with insulated exterior and can be custom sized to meet user needs.

B79-10537
DETERMINING RADII OF CYLINDRICAL SEGMENTS
R. J. BUZZARD
Jun. 1980
LEWIS-12826 **Vol. 4, No. 4, p. 536**

Simple method determines either inside or outside radius of cylindrical segment when full diametrical section of material is not accessible for caliper measurement or if size, condition, or maneuverability of cylinder is not amenable to use of template or comparator-type devices. Method employs standard micrometer or depth gage with ball-end rod and fixed-length baseplate. Method is more adaptable in variety of situations than are existing methods, and measurements can be obtained under conditions that may be difficult if not impossible using other methods.

B79-10538
OVERALL LOUDNESS OF STEADY SOUNDS
W. L. HOWES and V. R. CANRIGHT (U.S. Army Research & Technology Labs.)
Jun. 1980 See also NASA-RP-1001(N79-25753)
LEWIS-12914 **Vol. 4, No. 4, p. 537**

Loudness (in sones) and loudness level (in phons) of any sound that is steady for tenths of second can be calculated using computer program derived from new operational theory of loudness. Theory is constructed from psychoacoustic and physiological data on mammalian (monkey) auditory systems. Computer program permits prediction of loudness of any steady sound including, for example, transportation noises, machinery noises, and other environmental noises, with possible additional applications to broadcasting, sound reproduction, establishment and enforcement of noise laws.

B79-10539
NONLINEAR STRUCTURAL ANALYSIS
W. E. HAISLER (Texas A&M Research Foundation)
Jun. 1980
M-FS-25122 **Vol. 4, No. 4, p. 537**

Development of computer programs for nonlinear structural analyses has progressed from special application programs to large, generalized programs. AGGIE I program is moderately-sized finite-element program that was developed specifically for nonlinear structural analysis. It is based on two- and three-dimensional isoparametric solid elements. AGGIE I accounts for nonlinearities due to large displacements, large strains and nonlinear material behavior.

B79-10540
REDUNDANT STRUCTURES AT ELEVATED TEMPERATURES
L. I. GUIDRY (Rockwell International Corp.) and G. H. MINTZ (Rockwell International Corp.)
Jun. 1980
MSC-18476 **Vol. 4, No. 4, p. 538**

In many structural systems, it is desirable to perform analysis to determine how safe structure is when subjected to 'yielding' loads. FRAME 1 computer program analyzes, in both plastic and elastic ranges, redundant structures subjected to thermal and mechanical loads.

B79-10541
AERODYNAMIC PERFORMANCE OF JET-FLAP WINGS
G. R. HOUGH (Vought Corp.)
Jun. 1980
ARC-11215 **Vol. 4, No. 4, p. 538**

Computer program analyzes performance of jet-flap wings. Fast and easy-to-use prediction technique, it generates accurate solutions for wide range of wing geometries and trailing-edge jet momentum distributions. Analysis is based on optimized vortex-lattice approach and results in rapid convergence of both overall and distributed loadings.

B79-10542
TRANSONIC FLOW PAST SWEPT WINGS
D. A. CAUGHEY (Cornell Univ.) and A. JAMESON (New York Univ.)
Jun. 1980
LANGLEY-12446 **Vol. 4, No. 4, p. 539**

FLO-22 computer program aids in numerical analysis of transonic potential flow past lifting, swept wing. FLO-22 uses relaxation method to solve finite-difference approximation of full-potential equation for transonic flow past configuration consisting of wing or arbitrary planform and dihedral extending from symmetry plane or wall. Comparisons of FLO-22 calculated results with experimental data for both conventional and super-critical transport wings show good agreement.

B79-10543
TRANSONIC AIRFOIL ANALYSIS AND DESIGN
L. A. CARLSON (Texas A. & M. Univ.)
Jun. 1980
LANGLEY-12354 **Vol. 4, No. 4, p. 540**

TRANDES program provides aircraft engineer with accurate and efficient tool for analysis of steady, irrotational, transonic flow over specified two dimensional airfoil in free air. Program is used to design airfoils having prescribed pressure distribution, including effects of weak viscous interaction. TRANDES yield accurate solutions efficiently for biconvex, conventional, and aftcambered airfoils.

B79-10544
HELICOPTER SLING LOADS
J. D. SHAUGHNESSY, K. R. YENNI, and T. N. DEAUX (Sperry Rand Corp.)
Jun. 1980
LANGLEY-12557 **Vol. 4, No. 4, p. 540**

Computer program compares various control-system concepts for improving handling qualities of single-rotor helicopters carrying relatively-large external sling loads. Computer program developed to test these and other ideas helps to circumvent expensive prototype and field testing. Comparisons between (1) computed data and flight data, (2) simulation-system values and flight test data, and (3) pilot evaluations of simulation and actual-flight conditions are very favorable.

B79-10545
WING AND LEADING-EDGE THRUST
H. W. CARLSON and R. J. MACK
Jun. 1980
LANGLEY-12516 **Vol. 4, No. 4, p. 541**

Computer program predicts leading-edge thrust for wings of arbitrary planform at supersonic speeds. Methods used in program are based on linearized wing theory. Program first calculates lifting pressures, lift coefficients, drag coefficients, moment coefficients, and lift distributions by using aft-element sensing technique. Next, empirical function calculates set of adjusted pressure-coefficient locations along leading edge. This information is then used to determine limiting value of singularity parameter and value of local leading-edge thrust coefficient.

B79-10546
SPACECRAFT TRAJECTORY

J. L. HORSEWOOD (Business & Technological Systems, Inc.) and F. J. MANN (Business & Technological Systems, Inc.)
Jun. 1980
LEWIS-13248 **Vol. 4, No. 4, p. 541**

Two programs, Hiltop I and Hiltop II, generate optimum trajectory data for electric propulsion missions of interest in exploration of solar system. Propulsion-system logic is activated by single program-input key; program modifications retain Hiltop I within framework of logic, so that Hiltop I input files, will run Hiltop II version and produce identical results as before.

07 MACHINERY

B79-10118
ENSURING FLAT CUTS IN LONGWALL MINING
R. A. CAMPBELL, J. R. CURRIE, E. T. DEATON, and R. R. KISSEL
Aug. 1979
M-FS-23726 **Vol. 4, No. 1, p. 117**

Minicomputer-controlled towed vehicle automatically determines flatness of wall of coal or other mineral as it is being cut by mining machine and allows machine operator to correct cut as necessary. Vehicle is used for longwall mining.

B79-10119
FILM-ADVANCE MONITOR
F. R. DREISBACK, E. T. FREEMAN, and C. W. STUMP
Aug. 1979
LANGLEY-12474 **Vol. 4, No. 1, p. 118**

Device checks film advancement in remote cameras by adding optoelectronic sensor and idler sprocket with beam-breaker disk. Monitor is helpful to operators of cameras placed in hostile environments.

B79-10120
PLUG AND DRILL TEMPLATE
S. ORELLA (Grumman Aerospace Co.)
Aug. 1979
MSC-16748 **Vol. 4, No. 1, p. 119**

Device installs plugs and then drills them after sandwich face sheets are in place. Template guides drill bit into center of each concealed plug thereby saving considerable time and fostering weight reduction with usage of smaller plugs.

B79-10121
ANTENNA DEPLOYMENT MECHANISM
C. R. GRIFFIN and W. A. LEAVY
Aug. 1979
GSFC-12331 **Vol. 4, No. 1, p. 120**

All-mechanical antenna deployment system operates by single cable tensioned by electrically driven drum. Device is comprised of set of pulleys fixed to telescoping antenna mast, ratchet which prevents premature antenna retraction, and special latch which holds antenna in retracted position.

B79-10122
REMOTE MANIPULATOR FOR IC WAFERS
J. L. HUDGINS
Aug. 1979
M-FS-23846 **Vol. 4, No. 1, p. 121**

Mechanical manipulator automatically loads, transports, and unloads silicon wafers between processing stations in large-scale integrated-circuit fabrication facility at Marshall Space Flight Center thus eliminating need for human opeators at various stages in processing cycle. It also reduces possibility of wafer contamination.

B79-10123
VOLUME-CHANGE INDICATOR FOR MOLDING PLASTIC
W. C. HELER
Aug. 1979
LANGLEY-12280 **Vol. 4, No. 1, p. 122**

Monitor consisting of two concentric disks measures change in volume of charge during compression/displacement molding. Device enables operator to decide whether process pressure and temperature are set properly or whether sufficient material has been placed in mold.

B79-10124
REMOVABLE FASTENER FOR INSULATING TILES
J. N. BROWN (Rockwell International Corp.), D. H. CADE (Rockwell International Corp.), and H. A. LOGSTON (Rockwell International Corp.)
Aug. 1979
MSC-16483 **Vol. 4, No. 1, p. 123**

Fastening device that consists of internally threaded silica insert, silica plug, and molded rubber retainer, seals holes in ceramic tiles securely over wide temperature excursions without cracking from thermal stresses. Device proves useful in high-temperature industrial applications.

B79-10125
RUBBER VALVE SEAL WITH TOUGH SKIN
J. W. MARTIN (TRW, Inc.)
Aug. 1979
LANGLEY-11776 **Vol. 4, No. 1, p. 124**

Curing technique for producing variable viscosity seal has hard sealing surface supported by softer rubber. Valve seal is clamped between two jaws for curing with hotter jaw at temperature of approximately 350 F and lower at room temperature. Result is durable tight valve-seat.

B79-10126
PARACHUTE DEPLOY/RELEASE MECHANISM
D. B. ROBELEN
Aug. 1979
LANGLEY-11575 **Vol. 4, No. 1, p. 125**

Mechanism operated by signals from single radio-control channel deploy and releases small drogue parachute from flying aircraft. Technique has uses in industrial process control and in recreational hobby applications.

B79-10127
REMOVABLE FASTENER FOR LARGE STRUCTURES
M. D. THULSON (Martin Marietta Corp.)
Aug. 1979
M-FS-23990 **Vol. 4, No. 1, p. 126**

Frame clamps lateral braces for assembling trusses, scaffolds, and other structures. Although approach originally proposed for assembling antennas and solar arrays in space, method is useful in temporary structures which require fastening before they are permanently welded or bonded.

B79-10128
QUARTZ BALL VALUE
C. GOETZ (Motorola, Inc.) and W. M. INGLE (Motorola, Inc.)
Aug. 1979
NPO-14473 **Vol. 4, No. 1, p. 127**

Quartz ball valve consisting of two quartz joints sealed back-to-back and seated in quartz sockets perform at temperatures of up to 1,250 C and in corrosive chemical environments without contamination or degradation.

B79-10129
METALLIC VIBRATION ISOLATORS
S. BENADO (Sundstrand Corp.) and K. J. HOTZ, JR. (Sundstrand Corp.)
Aug. 1979
M-FS-23949 **Vol. 4 No. 1, p. 127**

Woven metallic replacements for rubber isolators withstand heat, vacuum, and thermal shock. Isolators find uses where rubber deteriorates or its mechanical properties are inadequate. Potential applications are in power generators, vehicles, machinery, and portable tools.

B79-10130
CONTROLLER FOR A STRING ENGINE
A. R. MCDOUGAL
Aug. 1979
NPO-14388 **Vol. 4, No. 1, p. 128**
Hydraulic mechanism enables operator to adjust power and rotational direction of output of Stirling engine by applying only small force to control lever. Stirling engine has expander and displacer sections.

B79-10131
PRECISION LEVELING OF LARGE MACHINERY
H. P. PHILLIPS
Aug. 1979
NPO-13257 **Vol. 4, No. 1, p. 130**
Tool originally developed to level massive circular runners on antennas for communicating with space vehicles is modified to accurately align and level other large machines thus proves faster and more accurate than surveying technique.

B79-10132
STIFFNESS AND DAMPING OF ELASTOMERIC O-RINGS
M. S. DARLOW (Mechanical Technology, Inc.), R. K. MEHTA (Mechanical Technology, Inc.), and J. SMALLEY (Mechanical Technology, Inc.)
Aug. 1979 see also NASA-CR-135328 (N78-18460)
LEWIS-13079 **Vol. 4, No. 1, p. 131**
Report presents parameter preturbation test program (using nineteen combinations of Test perameters) for elastomeric O-rings conducting for range of materials, temperatures, amplitudes, squeeze valves, stretch valves, cross-sectional diameters, and groove widths. Tests data were plotted and Power law lines fitted to sets of data.

B79-10133
ANNULAR ACOUSTIC LINERS FOR TURBOFAN ENGINES
G. L. MINNER and E. J. RICE
Aug. 1979
LEWIS-12810 **Vol. 4, No. 1, p. 132**
Computer Program (written in FORTRAN IV) for design annular acoustic liners for turbofan engines first estimates noise generated by turbofan engine, then permits methodical examination of alternative choices of noise reduction.

B79-10258
EXTRA-SAFE TRACTOR-TRAILER COUPLING
W. P. ALBRECHT and R. H. SPARKS
Dec. 1979
FRC-10081 **Vol. 4, No. 2, p. 271**
Built-in safety mechanism for tractor-trailer 'fifth-wheel' coupling keeps rig together in case kingpin failure. Modified coupling utilizes all standard components, such as two wear plates, kingpin, and kingpin latch. It is modified by adding semicircular lip to top wear plate, matching semicircular slot to bottom wear plate, and two latching stop mechanisms.

B79-10259
LASH-FREE SPHERICAL BEARING
L. A. HEIN and W. N. MYERS
Dec. 1979
M-FS-23447 **Vol. 4, No. 2, p. 272**
Grooved and chamfered spherical bearing can maintain close contact between its ball and race, even when it is vibrated. Bearing thus eliminates major cause of wear and loosening in spherical bearings: pounding of ball on race under vibration.

B79-10260
CRYOGENIC-CONTAINER SUSPENSION STRAP
J. W. VORREITER
Dec. 1979
ARC-11157 **Vol. 4, No. 2, p. 273**
Fiberglass/epoxy supporting strap holds inner shell of cryogenic storage tank away from outer shell. Strap, made of two or more links, reduces heat leakage into cryogenic fluid more efficiently than conventional suspension systems.

B79-10261
COMPOSITE BEARING LINERS HAVE SERVICE TEMPERATURE OF 600 F
H. E. SLINEY
Dec. 1979 See also NASA-TM-78935 (N78-26445)
LEWIS-13277 **Vol. 4, No. 2, p. 274**
Self-lubricating graphite-fiber-reinforced polyimide liners for plain bearings raise service temperature from 325 F to 608 F.

B79-10262
ALL-METAL MUFFLER FOR DUCTS
P. T. SODERMAN (U. S. Army) and T. D. SCHARTON (Bolt, Beranek & Newman, Inc.)
Dec. 1979
ARC-11159 **Vol. 4, No. 2, p. 275**
Steel- or aluminum-skinned baffles absorb sound from air flowing over them. Because there is no bulk filler, muffler does not collect contaminants. If dirt accumulates on skin, it can be washed away without damaging muffler.

B79-10263
MULTIPURPOSE SEALS FOR PRESSURE VESSELS
A. E. BUGGELE
Dec. 1979 See also NASA-TM-X-73680 (N77-28493)
LEWIS-12944 **Vol. 4, No. 2, p. 276**
Cryogenic or multipurpose seals made by using new materials. Seal possesses sufficient flexibility to contain high-pressure fluids regardless of dimensional changes from eigher pressure and/or temperature effects. Seal system operates in dual mode. Increased pressure supplements total sealing effort of seal system, which self-compensates for thermal contraction.

B79-10264
RETAINERS FOR THREADED PARTS
N. M. DAVIS (Bertea Corp.) and J. L. MANN (Bertea Corp.)
Dec. 1979
MSC-16198 **Vol. 4, No. 2, p. 278**
Retaining ring and fine wire secure nuts or screws reliably. Retainer is easy to assemble and to disassemble, even in confined areas.

B79-10265
SIMPLE NOISE SUPPRESSOR FOR VENTED HIGH-PRESSURE GAS
R. G. HUFF
Dec. 1979
LEWIS-13231 **Vol. 4, No. 2, p. 278**
Technique significantly reduces noise level. It uses principle of overexpansion of supersonic jet to create a multiple, strong shock-wave system in pipe, thereby decreasing exit velocity of jet and associated jet-mixing noise.

B79-10266
BIFUNCTIONAL GAS-FLOW REGULATOR
E. F. KOCH (Caltech)
Dec. 1979
NPO-13135 **Vol. 4, No. 2, p. 279**
Simple modification converts conventional high-pressure regulator to combination pressure-regulator/shutoff valve. Modification entails adding second diaphragm and pressure compartment. Modified valve is switched between its two functions by external two-position low-pressure valve.

B79-10267
EXTENDABLE MAST
J. V. COYNER, JR. (Astro Research Corp.) and J. M. HEDGEPETH (Astro Research Corp.)
Dec. 1979
LANGLEY-12078 **Vol. 4, No. 2, p. 280**
Extendable mast is constructed from mutually supporting members that unfold as mast is deployed from compact package. Extendable mast is sturdy and can be compared to conventional rigid structures.

B79-10268
LOW-COST BORING MILL

R. A. HIBDON (Boeing Services International, Inc.)
Dec. 1979
KSC-11112 **Vol. 4, No. 2, p. 281**

Portable unit and special fixture serve as boring mill. Machine, fabricated primarily from scrap metal, was designed and set up in about 12 working days. It has reduced setup and boring time by 66 percent as compared with existing boring miles, thereby making latter available for other jobs. Unit can be operated by one man.

B79-10269
BOND GRAPH FOR MODELING VALVES AND SWITCHES
V. D. GEBBEN
Dec. 1979
LEWIS-13177 **Vol. 4, No. 2, p. 282**

Digital graph element represents two-state devices. It can be used in modeling mechanical stops, backlash, and other discontinuities that occur whenever subsystems are connected or disconnected.

B79-10270
EXTRA-STRONG 'FLOATING NUT'
J. F. CHARLES (Rockwell International Corp.) and H. THEAKSTON (Standard Press Steel)
Dec. 1979
MSC-16938 **Vol. 4, No. 2, p. 283**

Increased bearing area withstands much higher torque than previous designs. Floating nut makes it possible to fasten parts on heavy-duty equipment, such as tractors and cranes, even though they can be reached for tightening from one side only.

B79-10271
FOLDABLE BEAM
R. F. CRAWFORD (Astro Research Corp.)
Dec. 1979 See also B77-10424
LANGLEY-12076 **Vol. 4, No. 2, p. 284**

Articulated beam folds into helix around cylindrical hub without segments becoming twisted. Twisting motion that normally occurs when a structure is folded into helix is undesirable in segmented beam because it complicates joints between segments.

B79-10272
ROTATING-SHAFT SEALS
Innovator not given (Space Propulsion & Power Division of Lewis Research Center) Dec. 1979 See also NASA-SP-8121 (N78-30584)
LEWIS-13227 **Vol. 4, No. 2, p. 285**

Monograph organizes and presents significant experience and knowledge accumulated by NASA in development and operational programs. Purpose is to assist designers. It reviews and assesses current design practices and from them establishes quidance for achieving greater consistency in design, increased reliability in end product, and greater efficiency in design effort.

B79-10273
AXIAL-FLOW TURBOPUMPS
Innovator not given (Space Propulsion & Power Division of Lewis Research Center) Dec. 1979 See also NASA-SP-8125 (N78-31164)
LEWIS-13228 **Vol. 4, No. 2, p. 286**

Monograph organizes and presents significant experience and knowledge accumulated by NASA in development and operational programs. It assists system designers. It reviews and assesses current design practices and from them establishes guidance for achieving greater consistency in design, increased reliability in end product, and greater efficiency in design effort.

B79-10400
AUTOMATIC THERMAL SWITCH
J. W. CUNNINGHAM and L. D. WING
Apr. 1980
GSFC-12415 **Vol. 4, No. 3, p. 417**

Automatic thermal switch closes and opens heat-flow path in response to temperature changes. Control is used to regulate temperature in electronic circuitry or cryogenic refrigeration equipment.

B79-10401
COMPACT ROTARY SEQUENCER
W. T. APPLEBERRY (Rockwell International Corp.)
Apr. 1980
MSC-19514 **Vol. 4, No. 3, p. 418**

Rotary sequencer is assembled from conventional planetary differential gearset and latching mechanism utilizing inputs and outputs which are coaxial. Applications include automated production-line equipment in home appliances and in vehicles.

B79-10402
SEALED-IN-QUARTZ RESISTANCE HEATER
C. G. MILLER (Caltech) and J. B. STEPHENS (Caltech)
Apr. 1980
NPO-14529 **Vol. 4, No. 3, p. 419**

Electric resistance quartz heater operates at 1,400 F without developing excessively hot spots that can fail prematurely. Since resistance element is sealed in quartz, heater can be used in hostile environments. Sealed construction also keeps heater from contaminating heated object.

B79-10403
REMOTELY CONTROLLED LATCH
C. J. BARNETT (Rockwell International Corp.), P. CASTIGLIONE (Rockwell International Corp.), and L. R. CODA (Rockwell International Corp.)
Apr. 1980
MSC-18365 **Vol. 4, No. 3, p. 420**

Mechanism engages and disengages parallel plates carrying couplings and connectors. Designed to lock items in place for handling, storage, or processing under remote control, mechanism has fail-safe feature which does not allow plates to separate completely unless both are supported.

B79-10404
TORQUE-WRENCH EXTENDER FOR HARD-TO-REACH FASTENERS
S. SELIK (Rockwell International Corp.) and J. A. STEIN (Rockwell International Corp.)
Apr. 1980
MSC-18488 **Vol. 4, No. 3, P. 421**

Extension kit for torque wrench tightens and loosens captive fasteners in hard-to-reach places. Kit consists of four universal socket joints and extender rod enclosed in greased-packed tube. Extension kit replaces snap-on adapter and flexible drive shaft.

B79-10405
SLIP SENSOR
A. K. BEJCZY (Caltech)
Apr. 1980
NPO-14655 **Vol. 4, No. 3, p. 422**

Slippage of one surface, relative to another is detected by 'ball bearing' magnetic sensor. Omnidirectional sensor responds to slippage in any direction. Sensor is mounted in 'finger' of mechanical claw manipulator and signals operator who tightens grip by remote control when object slips.

B79-10406
COUPLER FOR REMOTE MANIPULATORS
A. A. RUDMANN
Apr. 1980
GSFC-12429 **Vol. 4, No. 3, p. 423**

Reliable, low-cost coupler alines and grasps moving and rotating objects. Coupling mechanism may be used in handling of radio-active materials or in underwater explorations and other remote manipulators.

B79-10407
CENTRIFUGAL RECIPROCATING COMPRESSOR
W. H. HIGH (Caltech)
Apr. 1980
NPO-14597 **Vol. 4, No. 3, p. 424**

Efficient compressor uses centrifugal force to compress gas.

System incorporates two coupled dc motors, each driving separate centrifugal reciprocating-compressor assembly. Motors are synchronized to accelerate and decelerate alternately.

B79-10408
ANGULAR-DISPLACEMENT MECHANISM
J. A. CALVERT
Apr. 1980
M-FS-23777 **Vol. 4, No. 3, p. 424**

Redundant-motor drive system, utilizing two electric motors, generates angular displacement to rotate mechanical or optical components in limited arc. Either motor can drive system while other remains stationary. Since stationary motor is not back-driven, system energy requirement is effectively reduced.

B79-10409
LONG-WEARING TFE/METAL BEARINGS
R. A. BRASS (Rockwell Intern. Corp.) and W. A. GILLON, JR. (Rockwell Intern. Corp.)
Apr. 1980
MSC-15994 **Vol. 4, No. 3, p. 425**

Method for making metal/polytetrafluoroethylene (TFE) bearing surfaces embeds long-wearing layer of TFE in microscopic pits in metal. Technique has potential applications in automotive gears, ball joints, and roller chain components. Other applications are in use of unlubricated bearings in chemical, pharmaceutical, and food-processing equipment.

B79-10410
POSITIVE ISOLATION DISCONNECT
M. V. FRIEDELL (Martin Marietta Corp.)
Apr. 1980 See also NASA-CR-144634 (N76-14187)
MSC-16043 **Vol. 4, No. 3, p. 426**

Positive-isolation-disconnect (PID) device with two mating halves prevents leakage or spillover when two fluid lines are disconnected. Each half has shutoff poppet to stop fluid flow. When flow is shut, poppets are flush against each other, leaving no space for fluid to remain it.

B79-10411
HEATED TOOL FOR AUTOCLAVES
T. T. SERAFINI, R. D. VANUCCI, P. J. CAVANO (TRW, Inc.), and W. E. WINTERS (TRW, Inc.)
Apr. 1980 See also NASA-CR-135377 (N78-25132)
LEWIS-12987 **Vol. 4, No. 3, p. 427**

Components made of composite materials are heated in autoclaves by employing electrical resistance heating blankets, thus avoiding need to heat entire autoclave volume. Method provides not only significant energy savings compared to heating entire pressure vessel but offers time savings in accelerated heat-up and cool-down cycles.

B79-10412
IMPROVED PISTON RINGS FOR A STIRLING ENGINE
A. R. MCDOUGAL (Caltech)
Apr. 1980
NPO-14497 **Vol. 4, No. 3, p. 428**

Cast-iron piston rings coated with commercially-available antifriction materials improves cylinder life of high-performance Stirling engine. Ring is efficient heat conductor between piston and cylinder. Device has low thermal expansion which maintains minimum gap in ring, good radial force characteristics, and essentially indefinite life.

B79-10413
THERMAL SEAL FOR HIGH AND LOW TEMPERATURES
J. E. COLLIPRIEST, JR. (Rockwell Intern. Corp.) and D. M. FELL (Rockwell Intern. Corp.)
Apr. 1980
MSC-16151 **Vol. 4, No. 3, p. 429**

Composite seal remains flexible between -423 and +500 F. Due to wide temperature capability seal outperforms conventional elastometic seals used in industrial freezers, environmental chambers, refrigerated trucks and railcars, and aircraft doors.

B79-10414
FLEXIBLE HEAT-AND-PRESSURE SEAL
J. BELLAVIA, JR. (Rockwell International Corp.) and J. O. KANE (Rockwell International Corp.)
Apr. 1980
MSC-18134 **Vol. 4, No. 3, p 430**

Device withstands both heat and pressure and accommodates relative motion between seated surfaces. Seal consists of flexible tube filled with thermally insulating material and coated with pressure resistant materials.

B79-10415
INSULATING SEAL FOR CRYOGENIC-LIQUID TRANSFER
I. M. KROENKE (Beech Aircraft Corp.)
Apr. 1980
KSC-11105 **Vol. 4, No. 3, p 431**

Modification to male bayonet on cryogenic transfer line prevents freezeup of transfer-line coupling and leakage of cryogenic liquid. Procedure helps leakage in plumbing and other cold fluids.

B79-10416
CRYOGENIC SEAL FOR INSTRUMENT WIRES
H. V. MASSEY (Federal-Mogul Corp.)
Apr. 1980
MSC-18450 **Vol. 4, No. 3, p 431**

Seal allows electrical wires to pass directly from sensors inside of liquid nitrogen storage vessel to outside instruments. No splices or connectors are required, so errors created by contact resistance are avoided. With method, measurements with highly sensitive instrumentation are made with greater accuracy.

B79-10417
STRONG, CORROSION-RESISTANT ALUMINUM TUBING
M. W. REED (Vought Corp.) and F. F. ADAMS (Vought Corp.)
Apr. 1980
MSC-18040 **Vol. 4, No. 3, p 432**

When aluminum tubing having good corrosion resistance and postweld strength is needed, type 5083 alloy should be considered. Chemical composition is carefully controlled and can be drawn into thin-wall tubing with excellent mechanical properties. Uses of tubing are in aircraft, boats, docks, and process equipment.

B79-10418
DYNAMIC-PRESSURE REGULATOR
R. R. WALKER (Rockwell International Corp.)
Apr. 1980
MSC-18415 **Vol. 4, No. 3, p 433**

Computerized pressure regulator controls gas pressure in fixed volume container, increasing, maintaining, and decreasing pressure according to programmed instructions. Controller is adaptable to any volume size or shape, and pressure variation may be synchronized.

B79-10419
BALANCED-FORCE FLOW-REGULATOR VALVE
W. C. HUBER
Apr. 1980
MSC-12731 **Vol. 4, No. 3, p 433**

Valve regulates fluid pressure or flow by means of porous barrier and reduces surfaces exposed to liquid or gas flow that cause unbalanced pressure forces. Applications include hand valves, spool valves, and other devices that meter or control gases or liquids.

B79-10420
IMPROVED WRAP-CURTAIN SEAL
P. M. SCHROEDER (Rockwell International Corp.)
Apr. 1980
MSC-16647 **Vol. 4, No. 3, p 435**

Wrapped-curtain thermal seal closes gaps around doors, windows, partitions, and other movable assemblies. Designed for simplicity, seal uses no springs or other mechanical devices and is easily installed on already existing structures.

B79-10421
ZERO-LEAK VALVE

W. F. MACGLASHAN, JR. (Caltech)
Apr. 1980
NPO-14717 **Vol. 4, No. 3, p 435**

Zero-leakage valve has fluid-sealing diaphragm support and flat sievelike sealing surface. Diaphragm-support valve is easy to fabricate and requires minimum maintenance. Potential applications include isolation valve for waste systems and remote air-actuated valve. Device is also useful in controlling flow of liquid fluorine and corrosive fluids at high pressures.

B79-10422
SEPARATION REGION ON BOATTAIL NOZZLES
J. D. BUTEAU (United Technology Corp.), R. W. KING (United Technology Corp.), and W. M. PRESZ, JR. (United Technology Corp.)
Apr. 1980
LANGLEY-12453 **Vol. 4, No. 3, p 436**

Computer subroutine package VISCUS offers flow analyst practical engineering computational procedure to model viscous effects of separated reverse flow on afterbody pressures and drag. Program is written in FORTRAN IV.

B79-10547
HIGH-ACCELERATION CABLE DEPLOYMENT
C. E. BARNS, T. N. CANNING, B. GIN, R. W. KING, and J. P. MURPHY
Jun. 1980
ARC-11256 **Vol. 4, No. 4, p. 545**

Prototype high-acceleration umbilical-cable deployment allows electrical communication between above-ground instrumentation and ballistic projectile below surface. Cable deployment is made up of forebody and afterbody. Forebody can be separated from afterbody by rocket, or they can be fired as unit at target that stops afterbody on impact (forebody would continue, deploying cable). Similar design could be used in study of sea ice and in other surface-penetration studies.

B79-10548
A SIMPLE SELF-SEALING PLUG
E. P. RUPPE (Rockwell International Corp.)
Jun. 1980
MSC-19635 **Vol. 4, No. 4, p. 546**

Inexpensive self-expanding plug makes convenient low-pressure seal. Simple elastomeric plug seals round ports and holes better than regular cork. Plug is inserted with plastic tool that squeezes it to diameter smaller than port opening. Once tool is removed, plug self-expands to its original shape, exerting stronger pressure to sealed surface than cork. Plug is less expensive to make than screw-on or cam-expanded seals.

B79-10549
MINIATURE MOTOR-DRIVEN INSTRUMENT VALVE
H. L. MINKIN
Jun. 1980
LEWIS-13195 **Vol. 4, No. 4, p. 547**

Valve consists of small geared reversible motor, operated by momentary contact closure, which drives shaft with O-rings placed to seal selected ports. Shaft rotates and also moves axially, causing ports to be alternately connected and disconnected. Electrical control of valve is provided by limit switches and relays. Design has advantage over other available valves: less precision machining of parts is required; machining operations are less expensive. Seals are made with O-rings, which are easily replaceable and inexpensive; valve uses less power. It can be used in any application requiring pilot valves for control devices.

B79-10550
FLEXIBLE SLIDING SEAL
E. L. WALLENHORST (Rockwell International Corp.)
Jun. 1980
MSC-18467 **Vol. 4, No. 4, p. 548**

Circular seal both slides and flexes to accommodate relative motion between two sealed members. Originally developed for Space Shuttle orbiter, it contains sliding seal to accommodate engine gimbaling and flexible seal that absorbs forward motion at high thrust of engine heat shield relative to airframe. Other possible applications are in support structures of heavy machinery and vehicle engines. Flexible sliding seal is ring about 7 feet in diameter and can withstand temperatures up to 1,600 F.

B79-10551
IMPROVED TABLE-SAW GUARD
B. R. DUNN (Rockwell International Corp.) and P. P. ZEBUS (Rockwell International Corp.)
Jun. 1980
MSC-19550 **Vol. 4, No. 4, p. 549**

Guard makes lighter contact on materials being sawed. Cuts are better controlled, and damages to fragile foam-type materials are reduced. Overhead support makes it possible to perform slot and step cuts, and thick materials are pushed under guard with less force. Guard is transparent plastic enclosure held by side-attached overhead support arm.

B79-10552
RECIRCULATING SPRAYER FOR FIBER-FILLED PAINTS
R. K. MAJOR (United Space Boosters, Inc.)
Jun. 1980
KSC-11146 **Vol. 4, No. 4, p. 550**

Recirculating paint sprayer applies spray of coarse filler in highly volatile solvent. Sprayer was developed for applying insulation material containing epoxy resin, glass fibers, and inert fillers suspended in chlorinated solvents. Sprayer resists abrasive action of fiberglass filler and chemical activity of solvent. Pump and position ensure more uniform pressure at spray gun without backpressure regulator, which tended to clog in old sprayer.

B79-10553
SCREW/STUD REMOVAL TOOL
K. DANIELS (Martin Marietta Corp.), D. E. HERRICK (Martin Marietta Corp.), and L. ROTHERMEL (Martin Marietta Corp.)
Jun. 1980
M-FS-22957 **Vol. 4, No. 4, p. 550**

Tool removes stubborn panheaded screws or studs where conventional tools would be either too weak or inconvenient to use. Screws with damaged heads or slots can also be removed this way. Tool can be worked with one hand and easily fits limited-access and blind areas. It can be made in various sizes to fit different screwheads.

B79-10554
A TOOL FOR INSTALLATION AND REMOVAL OF CYLINDRICAL BAFFLES
R. PESSIN (Rockwell International Corp.)
Jun. 1980
M-FS-19508 **Vol. 4, No. 4, p. 551**

Simple tool based on principle of automobile oil wrench slips over cylindrical thread-on baffle to install or remove it from baffle assembly. Tool consists of curled metal sheet brazed onto handgrip. Handgrip is adapted to be driven by wrench, ratchet, extension, torque wrench, or some other convenient tool. Clockwise twist of handgrip, tightens metal sheet around baffle to advance it into threaded joint. Counterclockwise twist loosens sheet for repositioning or tool removal.

B79-10555
SIMPLIFIED INSTALLATION OF THRUST BEARINGS
N. D. SENSENBAUGH (Rockwell International Corp.)
Jun. 1980
M-FS-19473 **Vol. 4, No. 4, p. 552**

Special handling sleeve, key to method of installing thrust bearings, was developed for assembling bearings on shaft of low-pressure oxygen turbo-pump. Method eliminates cooling and vacuum-drying steps which saves time, while also eliminating possibility of corrosion formation. Procedure saves energy because it requires no liquid nitrogen for cooling shaft and no natural gas or electric power for operating vacuum oven.

08 FABRICATION TECHNOLOGY

B79-10134
REPAIRING CRACKED GLASS
D. D. HELMAN (Rockwell International Corp.), J. W. HOLT (Rockwell International Corp.) and L. V. SMISER (Rockwell International Corp.)
Aug. 1979
KSC-11097 **Vol. 4, No. 1, p. 135**

Filing procedure consisting of machined lightweight fused-silica tiles coated with thin-layer of borosilicate glass produces homogeneous seal in thin glass. Procedure is useful in repairing glass envelopes, X-ray tub windows, Dewar flasks, and similar thin glass objects.

B79-10135
FIXTURE FOR LIMITED-ACCESS WELDING
J. R. TRYON (Rockwell International Corp.)
Aug. 1979
MSC-16698 **Vol. 4, No. 1, p. 136**

Fixture consisting of screw-on expansion clamps and backup bar aligns edges of plates for precision butt welding. Tool holds plates securely, without offset, and allows welding and clamp disassembly to be completed when there is access from only one side of structure.

B79-10136
GIANT-ELECTRODE WELDER
B. R. ATKINS (Martin Marietta Corp.), R. A. CHIHOSKI (Martin Marietta Corp.), and F. YASHIRO (Martin Marietta Corp.)
Aug. 1979
LANGLEY-11429 **Vol. 4, No. 1, p. 137**

Welder produces spot-welds in place of rivets and saves time and money. Unit comprised of conical copper electrode base diameter of 11.5 ft is also capable of welding very thin, hard aluminum alloys.

B79-10137
FURNACE BRAZING UNDER PARTIAL VACUUM
R. D. MCKOWN (Rockwell International Corp.)
Aug. 1979
M-FS-19363 **Vol. 4, No. 1, p. 138**

Brazing furnace utilizing partial-vacuum technique reduces tooling requirements and produces better bond. Benefit in that partial vacuum helps to dissociate metal oxides that inhibit metal flow and eliminates heavy tooling required to hold parts together during brazing.

B79-10138
ROOM-TEMPERATURE BONDING OF THIN PLASTIC SHEETS
R. E. FRAZER
Aug. 1979
NPO-14346 **Vol. 4, No. 1, p. 138**

Thin sheets of plastic are bonded together, without heat, by depositing metal films on plastic and applying light pressure. Films are pressed together at room temperature, technique which makes it possible to join organic material without high temperatures necessary for conventional adhesive bonding.

B79-10139
TEMPORARY INSULATION WITH POLYURETHANE FOAM
R. G. JACKSON (Rockwell International Corp.) and G. LERMA (Rockwell International Corp.)
Aug. 1979
MSC-18298 **Vol. 4, No. 1, p. 139**

Masking parts with Tetrafluoroethylene (TFE) tape allows easy removal of insulation; therefore, insulation can be used temporarily while testing of parts and then removed for their reworking.

B79-10140
ELECTROPLATING OFFERS EMBRITTLEMENT PROTECTION
C. M. DANIELS, JR. (Rockwell Intern. Corp.)
Aug. 1970
M-FS-19330 **Vol. 4, No. 1, p. 140**

Thin copper electrodeposited layer protects metal parts in environments with which they may be incompatible. Originally developed for main engine of Space Shuttle where high strength nickle alloy bellows must operate in high-pressure hydrogen, technique protects nickel and is unaffected by forming process or subsequent heat treatment and preinstallation processing.

B79-10141
WINDOW WITH INTEGRAL SEAL
J. M. BEHAR (Rockwell International Corp.)
Aug. 1979
MSC-16490 **Vol. 4, No. 1, p. 140**

Installation concept needed for air tight, water tight, laminated window does away with O-rings and sealants needed for effective edge seal. Pliable inner layer of laminating adhesive extends to form built-in gasket. Technique is usable for plastic or glass windows where space for gaskets and sealing rings is limited, canopies, and shields for military, marine, and land transportation vehicles.

B79-10142
FASTENING HARDWARE TO HONEYCOMB PANELS
A. KENGER (Grumman Aerospace Co.)
Aug. 1979
MSC-16752 **Vol. 4, No. 1, p. 141**

Adhesive bonding reduces likelihood of skin failure due to excessive forces or torques by utilizing an adhesive to honeycomb skin. Concept is useful in other applications of composites such as aircraft, automobiles, and home appliances.

B79-10143
VAPOR-DEPOSITED GRADED-THICKNESS FILMS
H. HERZIG and R. S. SPENCER
Aug. 1979
GSFC-11806 **Vol. 4, No. 1, p. 142**

Rotating substrate and slotted mask allow varying film thickness to be deposited from vapor by exposing film substrate to metal vapor through circular mask. Useful for fabricating variable thickness coatings for controlling thermal, electrical, or other properties.

B79-10144
APPLYING PHOTOSENSITIVE EMULSIONS TO ENAMEL SURFACES
W. FUHR (U. S. Radium Corp.)
Aug. 1979
MSC-18107 **Vol. 4, No. 1, p. 143**

Two layers of lacquer solve problem of adhesion to incompatible surface by spraying panels precoated with enamel paint with varying non-clear lacquers.

B79-10145
PLASTIC FILM INSULATES SOLAR CELLS FROM METAL SUBSTRATE
T. C. DVORAK (TRW, Inc.)
Aug. 1979
M-FS-25007 **Vol. 4, No. 1, p. 143**

Approach uses polyimide film bonded to aluminum plate using epoxy-impregnated fiberglass cloth as insulating layer. Because film is nonporous, problems due to voids are eliminated.

B79-10146
CUTTING SILICON FOR SOLAR CELLS
E. R. COLLINS
Aug. 1979
NPO-14406 **Vol. 4, No. 1, p. 144**

Multiple bandsaw blades are used to produce multiple cuts on several silicon boules simultaneously. Method is faster and more reliable than using single saw or multiple-cut reciprocating-blades.

B79-10147
FIXTURE FOR ASSEMBLING SOLAR PANELS
P. A. DILLARD (Lockheed Missiles and Space Co.) and W. M. FRITZ (Lockheed Missiles and Space Co.)
Aug. 1979
NPO-14303 **Vol. 4, No. 1, P. 145**
Vacuum fixture attaches array of silicon solar cells to mounting plate made of clear glass which holds and protects cells. Glass plate transmits, rather than absorbs, solar energy thus cooling cells for efficient operation. Device therefore reduces handling of cells and interconnecting conductors to one operation.

B79-10148
CMOS CIRCUIT-FABRICATION HANDBOOK
D. L. BOULDIN, R. W. EASTES, W. R. FELTNER, B. R. HOLLIS, JR., and D. E. ROUTH
Aug. 1979 See also NASA-TM-78188 (N78-78648)
M-FS-25034 **Vol. 4, No. 1, p. 146**
Report describes complementary metal-oxide-semiconductor (CMOS) process used to fabricate integrated circuits at Marshall Space Flight Center. It also presents general discussions of circuit design, mask making packaging, and testing.

B79-10274
ROTATABLE FIXTURE FOR SPRAY COATING
V. KATVALA, E. PORTER, and M. SMITH
Dec. 1979
ARC-11110 **Vol. 4, No. 2, p. 289**
Fixture that rotates about two axes ensures uniform coating and minimizes handling of coated workpiece. Each side of tile is coated in sequence by moving turntables until surface is perpendicular to spray. Process is repeated until desired thickness has built up.

B79-10275
TOOL CUTS SELF-LOCKING JOINTS IN PLASTICS
D. F. GOURLEY, S. C. IRICK, and H. H. MARSHALL
Dec. 1979
LANGLEY-12427 **Vol. 4, No. 2, p. 290**
Three lathe tools form different joints in gasket material.

B79-10276
FASTENER FOR EASY INSTALLATION AND REMOVAL OF TILES
L. H. MALETZ (Rockwell International Corp.)
Dec. 1979
MSC-16892 **Vol. 4, No. 2, p. 291**
Mating strips, one with metal hooks and one with metal loops, allow convenient mounting and removal on many kinds of modules. Principle is adaptable to applications where shear-resistant, compliants, removable fastening is needed in hard-to-reach places, especially when attached part is lightly loaded or fragile.

B79-10277
DISTORTION-FREE FOAMED-PLASTIC PARTS
P. A. HOGENSON (Rockwell International Corp.) and R. G. JACKSON (Rockwell International Corp.)
Dec. 1979
ARC-11233 **Vol. 4, No. 2, p. 292**
In process for molding foamed-plastic products, gases that are formed as byproducts of foaming reaction escape through perforated die. Thus, volatiles are not trapped in pockets that can deform and weaken the molded part.

B79-10278
VACUUM CASTING OF THICK POLYMERIC FILMS
E. F. CUDDIHY (Caltech) and J. MOACANIN (Caltech)
Dec. 1979
NPO-14534 **Vol. 4, No. 2, p. 292**
Bubble formation and layering, which often plague vacuum-evaporated films, are prevented by properly regulating process parameters. Vacuum casting may be applicable to forming thick films of other polymer/solvent solutions.

B79-10279
CLEANING CONTAMINATED SUPERALLOY POWDERS
A. E. ANGLIN
Dec. 1979
LEWIS-13041 **Vol. 4, No. 2, p. 293**
Cleaning process reduces level of contaminants in superalloy end product. Procedure has applications to variety of powder metallurgy contamination problems.

B79-10280
CONFINED EXPLOSIVE JOINING OF TUBES
L. J. BEMENT
Dec. 1979
LANGLEY-12248 **Vol. 4, No. 2, p. 294**
Technique uses explosive ribbon to join and seal tubes hermetically while totally confining explosive products, such as smoke, light, and sound. Only click is audible. Process yields joints of the same strengths as parent metal.

B79-10281
LOW-COST, HIGH-PERFORMANCE SEPARATOR FOR ALKALINE BATTERIES
L. HSU, W. H. PHILLIPP, and D. W. SHEIBLEY
Dec. 1979 See also NASA-TP-1407 (N79-21128)
LEWIS-12972 **Vol. 4, No. 2, p. 295**
Ion-transporting polymeric films are fabricated by cross-linking polyvinyl alcohols in situ. Major advantage of these strong, more chemically resistant films separators lies in ease of fabrication.

B79-10282
SPLICING SINGLE-MODE OPTICAL FIBERS
R. GOLDSTEIN (Caltech) and W. C. GOSS (Caltech)
Dec. 1979
NPO-14626 **Vol. 4, No. 2, p. 296**
Approach used to weld multimode fibers has been adapted for more exacting splicing of single-mode fibers. Precision cleaver with tungsten carbide knife edge cuts single-mode optical fibers for welding. Welding apparatus includes micromanipulator, microscopes, and vacuum chucks.

B79-10283
HIGH-ENERGY-DENSITY CYLINDRICAL CAPACITORS
R. D. PARKER (Hughes Aircraft Co.) and J. A. ZELIK (Hughes Aircraft Co.)
Dec. 1979 See also NASA-CR-135286 (N78-24458); B79-10284
LEWIS-12999 **Vol. 4, No. 2, p. 297**
Manufacturing technique produces high quality metalized-film cylindrical capacitors of energy density greater than 0.1 J/g uncased, using either 24-gage polyvinylidene flouride or 14-gage polycarbonate film. Components are wound wrinkle-free on hollow PTFE cores, using winding machine that applies constant dynamically controlled tension to film during winding operation.

B79-10284
HIGH-ENERGY-DENSITY FLAT FLEXIBLE CAPACITORS
R. D. PARKER (Hughes Aircraft Co.) and J. A. ZELIK (Hughes Aircraft Co.)
Dec. 1979 See also NASA-CR-135286 (N78-24458); B79-10283
LEWIS-13000 **Vol. 4, No. 2, p. 298**
Manufacturing technique produces flat flexible capacitors of energy density greater than 0.1 J/g. Exposure of some of metalized surface of each layer provides sufficient film surface to ensure good electrical connection to each layer of capacitor.

B79-10285
REMOVING OVERCOATINGS FROM MICROCIRCUITS
J. G. BELCHER, JR., D. P. NICOLAS, and F. VILLELLA
Dec. 1979
M-FS-23851 **Vol. 4, No. 2, p. 299**
Silicone resin of elastomer overcoatings are removed more quickly from microcircuit chips with hot concentrated sulfuric acid. Process takes few minutes as compared to day or two, using commercial solvents based on toluene, xylene, and the like. Overcoatings are removed to expose circuit for failure analysis.

B79-10286
ECONOMICAL SOLDER CONNECTIONS TO THIN FILMS
J. A. BASS and E. M. GADDY
Dec. 1979
GSFC-12404 **Vol. 4, No. 2, p. 300**
Soldering procedure, successfully tested for attaching leads to silicon solar cells, cover-glasses, is simple, inexpensive, and very effective in forming stable connection. Procedure uses solder of indium alloyed with either silver or tin.

B79-10287
LIFT-OFF PROCEDURE IMPROVES PATTERN DEFINITION
H. J. HOVEL (IBM Corp.) and H. A. HUGGINS (IBM Corp.)
Dec. 1979
LANGLEY-12392 **Vol. 4, No. 2, p. 301**
Layer of TiO2, economically deposited during integrated circuit fabrication, allows 'nonpattern' metal to be removed cleanly.

B79-10288
QUALITY CONTROL DURING IC PROCESSING
Innovator not given (Integrated Circuit Engineering Corp.) Dec. 1979
M-FS-25112 **Vol. 4, No. 2, p. 302**
Manual gives detailed test procedures for controlling silicon-wafer processing in manufacture of integrated circuits. Included among 43 test procedures are: ionic, bacterial, and solids contamination of high-purity water needed for wafer processing; crystallographic reflection, purity, and orientation; substrate dimensions and finish; thickness of deposited epitaxial films; oxide quality; photoresist characteristics; pinholes in insulating layers; metallized adhesion; and quality of ohmic contact.

B79-10423
FIXTURE FOR WINDING TRANSFORMERS
M. T. MCLYMAN (Caltech)
Apr. 1980
NPO-14146 **Vol. 4, No. 3, p 439**
Bench-mounted fixture assists operator in winding toroid-shaped transformer cores. Toroid is rigidly held in place as wires are looped around. Arrangement frees both hands for rapid winding and untangling of wires that occurs when core is hand held.

B79-10424
FABRICATION OF A PILLOWED AIRBAG
L. M. LAMBERT (Rockwell Intern. Corp.) and G. OKAMOTO (Rockwell Intern. Corp.)
Apr. 1980
MSC-18455 **Vol. 4, No. 3, p 439**
Rubber airbag composed of many small air 'pillows' is used as cushion for equipment during shipment. Airbag can also be used to apply uniform pressure to plastics or composites during curing.

B79-10425
TECHNIQUE FOR MOUNTING PYROELECTRIC DETECTOR ARRAYS
R. A. BRECKENRIDGE, A. L. FRIPP, and J. B. ROBERTSON
Apr. 1980
LANGLEY-12363 **Vol. 4, No. 3, p 440**
Technique is developed at Langley Research Center for mounting pyroelectric detector arrays on silicon integrated circuits. Procedure incorporates normal silicon integrated-circuit technology to form quasi-free mounts for detector arrays. Advantages of technique include lower cost, better image registration, and improved reliability.

B79-10426
REPAIRING CERAMIC INSULATING TILES
B. R. DUNN (Rockwell Intern. Corp.) and E. L. LAYMANCE (Rockwell Intern. Corp.)
Apr. 1980
MSC-18368 **Vol. 4, No. 3, p 441**
Fused-silica tiles containing large voids or gauges are repaired without adhesives by plug insertion method. Tiles are useful in conduits for high-temperature gases, in furnaces, and in other applications involving heat insulation.

B79-10427
DIMPLING AIRCRAFT SKINS FOR COUNTERSUNK-HEAD RIVETS
J. G. BARBOUR
Apr. 1980
LANGLEY-12240 **Vol. 4, No. 3, p 442**
Inexpensive hand-operated tool is used to dimple airframe skins to receive countersunk-head rivets. Tool replaces bulky pneumatic equipment normally used for dimpling and is useful for one person operation, thereby saving time and manpower.

B79-10428
SAFE BENDING OF BORON/ALUMINUM SHEETS
G. G. LISKAY (Rockwell Intern. Corp.) and S. Y. YOSHINO (Rockwell Intern. Corp.)
Apr. 1980
MSC-19525 **Vol. 4, No. 3, p 442**
Low cost procedure utilizing aluminum backing sheets protects boron/aluminum sheet from cracking during bending. Process utilizes inexpensive universal-brake bending dies rather than special hydroforming dies.

B79-10429
HEAT-SHRINKABLE FILM IMPROVES ADHESIVE BONDS
J. M. JOHNS (Vought Corp.) and M. W. REED (Vought Corp.)
Apr. 1980
MSC-18437 **Vol. 4, No. 3, p 443**
Pressure is applied during adhesive bonding by wrapping parts in heat-shrinkable plastic film. Film eliminates need to vacuum bag or heat parts in expensive autoclave. With procedure, operators are trained quickly, and no special skills are required.

B79-10430
DESIGN RULES FOR CMOS/SOS CIRCUITS
Innovator not given (Government Systems Division of RCA Corp.) Apr. 1980
M-FS-25132 **Vol. 4, No. 3, p 444**
Report presents design rules for advanced-technology integrated circuits made by self-aligned silicongate complementary - metal - oxide - semiconductor/silicon-on-sapphire (CMOS/SOS-process.

B79-10431
CMOS/SOS PROCESSING
P. RAMONDETTA (RCA Corp.)
Apr. 1980
M-FS-25176 **Vol. 4, No. 3, p 444**
Report describes processes used in making complementary - metal - oxide - semiconductor/silicon-on-sapphire (CMOS/SOS) integrated circuits. Report lists processing steps ranging from initial preparation of sapphire wafers to final mapping of 'good' and 'bad' circuits on a wafer.

B79-10432
LOW-COST PRODUCTION OF SOLAR-CELL PANELS
D. B. BICKLER (Caltech), B. D. GALLAGHER (Caltech), and L. E. SANCHEZ (Caltech)
Apr. 1980
NPO-14453 **Vol. 4, No. 3, p 444**
Large-scale production model combines most modern manufacturing techniques to produce silicon-solar-cell panels of low costs by 1982. Model proposes facility capable of operating around the clock with annual production capacity of 20 W of solar cell panels.

B79-10433
RF-SPUTTERED AND ION-PLATED SOLID LUBRICANTS
T. SPALVINS
Apr. 1980 See also NASA-TM-78841 (N78-20333)
LEWIS-13147 **Vol. 4, No. 3, p 445**
Report reviews advances in tribological uses of RF-sputtered and ion-plated films of solid film lubricants (laminar solids, soft

metals, organic polymers) and wear-resistant refractory compounds.

B79-10434
PHOTOMASK AND PATTERN PROGRAMS
R. K. KIRSCHMAN (Caltech)
Apr. 1980
NPO-14419 **Vol. 4, No. 3, p 446**
Package of computer programs helps designers with layout and graphics of photomasks. Photomasks are specifically useful to applications involving fine reproducibility, repetition, and fabrication on planar surfaces of materials, items fabricated from photomasks include circuit boards, magnetic bubble devices and integrated optic circuits.

B79-10435
SOLAR ARRAY MANUFACTURING INDUSTRY SIMULATION
R. G. CHAMBERLAIN (Caltech), P. J. FIRNETT (Caltech), and B. KLEINE (Caltech)
Apr. 1980
NPO-14747 **Vol. 4, No. 3, p 446**
Solar Array Manufacturing Industry Simulation (SAMIS) program is a standardized model of industry to manufacture silicon solar modules for use in electricity generation. Model is used to develop financial reports that detail requirements, including amounts and prices for materials, labor, facilities, and equipment required by companies.

B79-10556
STRESS-RELIEVED SOLDER JOINTS
C. J. ZEMENICK (Rockwell Intern. Corp.)
Jun. 1980
MSC-14981 **Vol. 4, No. 4, p. 555**
Mechanical stress on solder joints is reduced by procedure for soldering electronic components to circuit boards. Procedure was developed for radio-frequency (RF) strip-line circuits, for which dimensions must be carefully controlled to minimize parasitic capacitance and inductance. Procedure consists of loosening component from its mounting after each lead is soldered relieving induced stresses before next soldering step.

B79-10557
REPAIRING FLAT CABLES
Innovator not given (Aerospace Division of Honeywell, Inc.) Jun. 1980
LANGLEY-11950 **Vol. 4, No. 4, p. 556**
Simple procedure avoids costly repairs. Cable insulation flaps are cut and peeled back to expose conductor fractures. Insulation layers of decreasing size allow cable to flex without overstressing mended connectors.

B79-10558
SCRATCH ENCOURAGES SELECTIVE DOPING
F. Z. HAWRYLO (RCA Corp.) and H. KRESSEL (RCA Corp.)
Jun. 1980
LANGLEY-11590 **Vol. 4, No. 4, p. 557**
Dislocations induced by scratching produce deep narrow spikes of zinc diffused in gallium arsenide. Density of defects formed locally increases zinc diffusion coefficient. Enhancements by factor of 6 have been observed. Technique works for other dopants than zinc and for other semiconductors besides GaAs.

B79-10559
WIRE STRIPPER PROTECTS CABLE SHIELDING
M. A. ECONOMU
Jun. 1980
FRC-10111 **Vol. 4, No. 4, p. 557**
Four-blade stripper removes insulation from end or middle of wire without damaging shielding.

B79-10560
STITCH-BOND PARALLEL-GAP WELDING FOR IC CIRCUITS
P. CHVOSTAL (Odetics, Inc.), J. TUTTLE (Odetics, Inc.), and R. VANDERPOOL (Odetics, Inc.)
Jun. 1980
MSC-16459 **Vol. 4, No. 4, p. 558**
Stitch-bonded flatpacks are superior to soldered dual-in-lines where size, weight, and reliability are important. Results should interest designers of packaging for complex high-reliability electronics, such as that used in security systems, industrial process control, and vehicle electronics.

B79-10561
CRIMPED THERMOCOUPLE CONNECTIONS
K. L. BILLINGTON (Rockwell Intern., Corp.) and H. S. MAY (Rockwell Intern. Corp.)
Jun. 1980
MSC-18489 **Vol. 4, No. 4, p. 559**
When proper procedures are followed, hand crimping tool makes reliable, low-cost thermocouple connections. Procedure reduces time and expense of splicing solid and stranded platinum thermocouple wires.

B79-10562
MULTILAYER METALIZATION OF MOS IC'S
D. L. BOULDIN, W. R. FELTNER, B. R. HOLLIS, JR., and D. E. ROUTH
Jun. 1980
M-FS-23541 **Vol. 4, No. 4, p. 560**
Modified ion-bombardment technique interconnects MOS circuit elements without affecting circuit parameters. Multilevel metalization involves: surface treatment prior to metalization; first metalization; metal pattern definition and photoresist removal; dielectric deposition; second metalization; and final dielectric deposition.

B79-10563
IMPROVED PROCESS CONTROL FOR VMOS FET'S
M. D. JHABVALA
Jun. 1980
GSFC-12515 **Vol. 4, No. 4, p. 561**
Method is applied in middle of fabrication process: (a) after mask region is formed, diffused-boron region is etched; (b) etching is left incomplete for ion implantation; (c) boron ions are implanted into region to define accurately crucial geometry of V-groove; (d) groove is etched to completion, forming two well-defined diffusion regions that serve as source and drain of transistor. Remaining process is conventional.

B79-10564
SECURING CONNECTOR PINS TO A PC BOARD
D. GRAHAM (Sperry Rand Corp.), R. WILKES (Sperry Rand Corp.), and J. ZORNS (Sperry Rand Corp.)
Jun. 1980
MSC-16059 **Vol. 4, No. 4, p. 561**
Solder preforms hold pins firmly to withstand repeated insertion and removal of circuit cards. Advantage is excellent electrical continuity between board circuits and pins.

B79-10565
IMPROVED SWITCH-RESISTOR PACKAGING
R. E. REDMERSKI (Rockwell Intern. Corp.)
Jun. 1980
MSC-19531 **Vol. 4, No. 4, p. 562**
Packaging approach makes resistors more accessible and easily identified with specific switches. Failures are repaired more quickly because of improved accessibility. Typical board includes one resistor that acts as circuit breaker, and others are positioned so that their values can be easily measured when switch is operated. Approach saves weight by using less wire and saves valuable panel space.

B79-10566
PRECISION SCRIBER
R. J. BUZZARD
Jun. 1980
LEWIS-12976 **Vol. 4, No. 4, p. 563**
Device scribes fine lines to precise tolerances on flat or round surfaces. Scriber is used in conjunction with toolmaker's microscope and will scribe metal of nonmetallic surfaces. When

not in use, scriber is easily retracted or swung out of way so microscope can be used for other purposes.

B79-10567
IMPROVED ACOUSTIC LEVITATION APPARATUS
L. H. BERGE, J. L. JOHNSON, W. A. ORAN, and D. A. REISS
Jun. 1980
M-FS-25050 **Vol. 4, No. 4, p. 564**

Concave driver and reflector enhance and shape levitation forces in acoustic resonance system. Single-mode standing-wave pattern is focused by ring element situated between driver and reflector. Concave surfaces increase levitating forces up to factor of 6 as opposed to conventional flat surfaces, making it possible to suspend heavier objects.

B79-10568
A PLASMA-SPRAYED VALVE COATING
A. BRENNAN (Rockwell Intern. Corp.) and A. B. OLMORE (Rockwell Intern. Corp.)
Jun. 1980
M-FS-19494 **Vol. 4, No. 4, p. 565**

Need to reduce wear on nickel alloy seats and poppets for Space Shuttle main engine led to fused cobalt/tungsten carbide coating. Coating, which is dense, wear-resistant, and nonporous, can be applied in controlled amounts to various substrate configurations. Ease of application to parts with intricate shapes and contours should make coating useful in automotive and aircraft manufacturing.

B79-10569
INHIBITING OXIDATION OF TUNGSTEN AT HIGH TEMPERATURES
J. LOMBARD (Rockwell Intern. Corp.) and M. MOYNAHAN (Rockwell Intern. Corp.)
Jun. 1980
M-FS-19347 **Vol. 4, No. 4, p. 565**

Coating of mixed ceramics protects tungsten from oxidation. Originally suggested for critical tungsten components on Space Shuttle, mixture consists of 98.5 percent aluminum oxide and 1.5 percent silicon dioxide. It is particularly useful in welding when there is danger that welding arc can burn adjacent components. If coating is applied to nearby tungsten parts, it prevents arcing.

B79-10570
ELECTRODEPOSITION PROCESS REDUCES COST OF COLD PLATES
E. P. RUPPE (Rockwell Intern. Corp.)
Jun. 1980
MSC-19524 **Vol. 4, No. 4, p. 566**

Efficient nickel heat-exchanger cold plates can be fabricated less expensively than stainless steel plates. If adapted to mass production, it is estimated that nickel cold plates might be made for about 30 percent less than stainless-steel plates.

B79-10571
TUBE-SHAPE VERIFIER
A. N. ANDERSON (Rockwell Intern. Corp.) and C. R. CHRIST (Rockwell Intern. Corp.)
Jun. 1980
MSC-19623 **Vol. 4, No. 4, p. 567**

Inexpensive apparatus checks accuracy of bent tubes. Assortment of slotted angles and clamps is bolted down to flat aluminum plate outlining shape of standard tube bent to desired configuration. Newly bent tubes are then checked against this outline. Because parts are bolted down, tubes can be checked very rapidly without disturbing outline. One verifier per tube-bending machine can really speed up production in tube-bending shop.

B79-10572
ADJUSTING AN ELECTRON BEAM FOR DRILLING
C. L. CHILDRESS (Rockwell Intern. Corp.)
Jun. 1980
M-FS-19326 **Vol. 4, No. 4, p. 568**

Reticle contains two concentric circles: inner circle insures beam circularity and outer circle is guide to prevent beam from cutting workpiece clamp. Precise measurement of beam and clamp are required with old reticle. New reticle speeds up electron-beam drilling process by eliminating need to rotate eyepiece to make measurements against reticle scale.

B79-10573
REPAIRING SEALING SURFACES ON ALUMINUM CASTINGS
T. L. HANNA (Rockwell Intern. Corp.)
Jun. 1980
M-FS-19455 **Vol. 4, No. 4, p. 568**

Approach using stylus nickel plating instead of copper and cadmium plating has simplified repair procedure. Damaged sealing surfaces are stylus nickelplated in one step. Superficial scratches and porous areas are removed more easily from repaired surface by simply lapping sealing areas to required finish. Although method is aimed for aerospace components, it may be easily incorporated into conventional aluminum casting technology. One-step repair can be considered for cast-aluminum automobile and aircraft engines to reduce time and costs.

B79-10574
PROTECTING BRAZING FURNACES FROM AIR LEAKS
C. T. ARMENOFF (Rockwell Intern. Corp.) and R. D. MCKOWN (Rockwell Intern. Corp.)
Jun. 1980
M-FS-19379 **Vol. 4, No. 4, p. 569**

Inexpensive inert-atmosphere shielding protects vacuum brazing-furnace components that are likely to spring leak. Pipefittings, gages, and valves are encased in transparent plastic shroud inflated with argon. If leak develops, harmless argon will enter vacuum chamber, making it possible to finish ongoing brazing or heat treatment before shutting down for repair.

B79-10575
AN IMPROVED WELDING-ARC STARTER
T. J. TAUFER (Rockwell Intern. Corp.)
Jun. 1980
MSC-17415 **Vol. 4, No. 4, p. 570**

Simple circuit modification makes pulse-arc starters more reliable at low currents. Once arc is started, it is maintained at lower voltage level that in previous arrangement due to sufficient concentration of metallic vapor between electrode and working surface as result of improved conduction.

B79-10576
MICROSCOPE FOR HIGH-TEMPERATURE WELDING
O. E. ACCOUNTIUS (Rockwell Intern. Corp.)
Jun. 1980
MSC-19572 **Vol. 4, No. 4, p. 571**

Dark glass in eyepieces lets welder look at fine parts without eye damage. Previously welder had to repair barely visible crack without magnification, because necessary goggles kept eyes too far from microscope eyepieces.

B79-10577
BRAZING TITANIUM TO STAINLESS STEEL
R. I. BATISTA (TRW, Inc.)
Jun. 1980
LANGLEY-11441 **Vol. 4, No. 4, p. 571**

Titanium and stainless-steel members are usually joined mechanically for lack of any other effective method. New approach using different brazing alloy and plating steel member with nickel resolves problem. Process must be carried out in inert atmosphere.

B79-10578
SWITCHBOX FOR WELDING TORCHES
R. K. BURLEY (Rockwell Intern. Corp.)
Jun. 1980
M-FS-19354 **Vol. 4, No. 4, p. 572**

Switchbox can be used to change from one welding torch setup to another without stopping production line. Simple flip of switch connects gas, water, and power to selected torch. In conventional systems, production must be stopped so that maintenance people can disconnect and reconnect another torch.

B79-10579
THERMAL JACK
C. T. ARMENOFF (Rockwell Intern. Corp.) and R. D. MCKOWN (Rockwell Intern. Corp.)
Jun. 1980
M-FS-19365 **Vol. 4, No. 4, p. 572**
Auxiliary furnace tool forces part to match length of mating part during brazing. As brazed assembly cools, jack contracts faster and disengages from fitting studs.

B79-10580
VIEWING ELECTRON-BEAM WELDS IN PROGRESS
C. T. ARMENOFF (Rockwell Intern. Corp.)
Jun. 1980
M-FS-19364 **Vol. 4, No. 4, p. 573**
With aid of optical filter, operator of electron-beam welding machine can view TV image of joint that is being welded and can make corrections as necessary. Operator can see when weld bead gets out of alignment, for example, and compensate for deflection of electron beam caused by changes in magnetic field.

B79-10581
WELDING MULTIPLE PLIES WITH AN ELECTRON BEAM
F. J. KILUK (Rockwell Intern. Corp.)
Jun. 1980
M-FS-19428 **Vol. 4, No. 4, p. 574**
Method for electron-beam welding of multi-ply metal sheets eliminates ply separation and minimizes porosity. Method was developed for assembling bellows made of four plies of iron/nickel alloy sheets. Method consists of making successive stitch welds with electron beam until weld seam is completely filled in and all plies have been penetrated.

B79-10582
BONDING SOFT RUBBER OR PLASTICIZED ELASTOMERS TO METAL
J. M. CLEMONS, F. E. LEDBETTER, III, and W. T. WHITE
Jun. 1980
M-FS-25181 **Vol. 4, No. 4, p. 574**
Approach using bond-cover coat of unplasticized rubber between soft rubber and adhesive eliminates diffusion problem. Approach is useful in making improved seals in automobile engines, industrial and public plumbing, and in other areas using soft-rubber-to-metal bonds. Seals and gaskets made this way would not have to be replaced very often, reducing cost of maintenance.

B79-10583
VACUUM-AND-PRESSURE LAMINATING POLYMER MATERIALS
D. R. HOFFMAN and T. J. RILEY
Jun. 1980
LEWIS-12721 **Vol. 4, No. 4, p. 575**
Lamination setup is used to produce void-free bonds by first employing vacuum to outgas materials and adhesive at temperature below curing temperature and then subjecting assembly to pressure and temperature necessary to cure.

B79-10584
EVACUATED-DISPLACEMENT COMPRESSION MOLDING
W. C. HEIR
Jun. 1980
LANGLEY-12523 **Vol. 4, No. 4, p. 576**
Compression-molding process comprises: loading molding compound; evacuation; applying pressure to shape softened compound; further compressing while using compound as hydraulic fluid; and applying heat and pressure for cure. Major advantage of method is that it prevents increase in cavity volume (sporadic or general) throughout transformation phase of molding.

B79-10585
ELECTROMAGNETIC BONDING OF PLASTICS TO ALUMINUM
A. T. SHEPPARD (Martin Marietta Corp.) and L. SILBERT (Martin Marietta Corp.)
Jun. 1980
M-FS-25083 **Vol. 4, No. 4, p. 577**
Electromagnetic curing is used to bond strain gage to aluminum tensile bar. Electromagnetic energy heats only plastic/metal interface by means of skin effect, preventing degradation of heat-treated aluminum. Process can be easily applied to other metals joined by high-temperature-curing plastic adhesives.

B79-10586
STRUCTURALLY-CONTINUOUS COMPOSITE CORNERS
A. C. JACKSON (Lockheed Aircraft Corp.) and J. A. VANHAMERSVELD (Lockheed Aircraft Corp.)
Jun. 1980
LANGLEY-11942 **Vol. 4, No. 4, p. 578**
Flat composite materials are cut at certain angles to form boxes with corners as thick as walls. Patterns produce uniform corners, and cuts are structured so that shear loads are transferred from ply to ply instead of across one surface.

B79-10587
REMOVING BONDED SKIN FROM A SUBSTRATE
E. N. CHARTIER (Rockwell Intern. Corp.)
Jun. 1980
MSC-19664 **Vol. 4, No. 4, p. 579**
Metal skin is peeled off like sardine-can cover with key. Method is useful in removing bonded skins from any substrate where substrate is strong enough not to buckle or tear when bonded skin is rolled free. Also, it is useful for removing sections of damaged skin where bladders of other equipment below substrate might be damaged if saw or router were used to cut completely through skin.

B79-10588
ARC-TERMINATION CRACKS IN INCONEL 718 AND INCOLOY 903
E. BAYLESS, J. MCCAIG, and R. POORMAN
Jun. 1980
M-FS-25089 **Vol. 4, No. 4, p. 579**
Four-phase study was launched to determine welding conditions conductive to crater cracks and to establish procedures for fixing them. Results of study are published in brief report.

B79-10589
COST SAVINGS IN LSI FABRICATION
R. P. HIMMEL (Hughes Aircraft Co.), S. SALMASSY (Hughes Aircraft Co.), and S. M. STUHLBARG (Hughes Aircraft Co.)
Jun. 1980
M-FS-25079 **Vol. 4, No. 4, p. 580**
One year study program was divided into three tasks: to identify costs factors involved in packaged electronic subsystems as function of LSI density and reliability; to select most promising factors that might be modified to reduce costs in high-density packaging; and to investigate cost-saving beam tape technology for producing high-volume discrete-device packages. Results are published in 67 page report.

09 MATHEMATICS AND INFORMATION SCIENCES

B79-10149
ESTIMATING THE COST OF PRODUCTION STOPPAGE
L. M. DELIONBACK
Aug. 1979 See also NASA-TM-78131 (N77-34044)
M-FS-23884 **Vol. 4, No. 1, p. 149**
Estimation model considers learning curve quantities, and time of break to forecast losses due to break in production schedule. Major parameters capable of predicting costs are number of units made prior to production sequence, length of production break, and slope of learning curve produced prior to break.

B79-10150
INEXPENSIVE LAND-USE MAPS EXTRACTED FROM SATELLITE DATA
T. W. BARNEY (Missouri Univ.), D. J. BARR (Missouri Univ.), C. D. ELIFRITS (Missouri Univ.), and C. J. JOHANNSEN (Missouri Univ.)
Aug. 1979
M-FS-25111 **Vol. 4, No. 1, p. 150**
Satellite images are interpretable with minimal skill and equipment by employing method which uses false color composite print of image of area transmitted from Landsat satellite. Method is effective for those who have little experience with satellite imagery, little time, and little money available.

B79-10151
LANDSAT AND WATER POLLUTION
P. CASTRUCCIO (Ecosystems Intern., Inc.), T. FOWLER (Ecosystems Intern., Inc.), and H. LOATS, JR. (Ecosystems Intern., Inc.)
Aug. 1979
M-FS-25099 **Vol. 4, No. 1, p. 150**
Report presents data derived from satellite images predicting pollution loads after rainfall. It explains method for converting LANDSAT images of eastern United States into cover maps for Baltimore/five county region.

B79-10152
ANALYZING EARTH'S SURFACE DATA
D. J. BARR (Missouri Univ.) and C. D. ELIFRITS (Missouri Univ.)
Aug. 1979
M-FS-25051 **Vol. 4, No. 1, p. 152**
Manual discusses simple inexpensive image analysis technique used to interpret photographs and scanner of data of Earth's surface. Manual is designed for those who have no need for sophisticated computer-automated analysis procedures.

B79-10153
REDUNDANT SYSTEM RELIABILITY ANALYSIS
C. J. MASRELIEZ (Boeing Co.)
Aug. 1979
LANGLEY-12069 **Vol. 4, No. 1, p. 152**
Computer Aided Redundant System Reliability Analysis (CARSARA) program facilitates reliability assessment of fault-tolerance reconfigurable systems. CARSRA accounts for influences from transient faults and is used to model wide range of redundancy management strategies.

B79-10289
PROGRAMING TECHNIQUES FOR CDC EQUIPMENT
J. R. NEWSOM (Vought Corp.) and S. H. TIFFANY (Vought Corp.)
Dec. 1979 See also NASA-CR-3033 (N78-28832)
LANGLEY-12486 **Vol. 4, No. 2, p. 305**
Five techniques reduce core requirements for fast batch turnaround time and interactive-terminal capability. Same techniques increase program versatility, decrease problem-configuration dependence, and facilitate interprogram communication.

B79-10290
COMPARING DATA TRANSMISSION SYSTEMS
R. F. RICE (Caltech)
Dec. 1979
NPO-14642 **Vol. 4, No. 2, p. 305**
Scheme for coding and compressing data signals for transmission are compared by new analytical technique. Transmission rate of several schemes are plotted for direct comparison and evaluation.

B79-10291
ANNUITY-ESTIMATING PROGRAM
D. W. JILLIE
Dec. 1979
ARC-11139 **Vol. 4, No. 2, p. 307**
Program computes benefits and other relevant factors for Federal Civil Service employees. Computed information includes retirement annuity, survivor annuity for each retirement annuity, highest average annual consecutive 3-year salary, length of service including credit for unused sick leave, amount of deposit and redeposit plus interest.

B79-10292
MULTIPURPOSE INTERACTIVE NASA INFORMATION SYSTEM
J. M. HILL (Computer Sciences Corp.), R. L. KEEFER (Computer Sciences Corp.), D. R. SANDERS (Computer Sciences Corp.), and R. N. SEITZ (Computer Sciences Corp.)
Dec. 1979
M-FS-23753 **Vol. 4, No. 2, p. 307**
Multipurpose Interactive NASA Information System (MINIS) is data management system capable of retrieving descriptive data from LANDSAT photos. General enough to be used with other user-defined data bases, interactive data management and information retrieval system was especially developed for small and medium-sized computers. It uses free-form data base that allows one to create entirely new and different data bases and to control format of output products.

B79-10293
MODEL FOR REFINING OPERATIONS
D. N. DUNBAR (Gordian Associates, Inc.) and B. G. TUNNAH (Gordian Associates, Inc.)
Dec. 1979
LEWIS-13047 **Vol. 4, No. 2, p. 308**
Program predicts production volumes of petroleum refinery products, with particular emphasis on aircraft-turbine fuel blends and their key properties. It calculates capital and operating costs for refinery and its margin of profitability. Program also includes provisions for processing of synthetic crude oils from oil shale and coal liquefaction processes and contains highly-detailed blending computations for alternative jet-fuel blends of varying endpoint specifications.

B79-10436
REVISED ADAGE GRAPHICS COMPUTER SYSTEM
J. S. TULPPO (Sperry Rand Corp.)
Apr. 1980
LANGLEY-12492 **Vol. 4, No. 3, p 449**
Bootstrap loader and mode-control options for Adage Graphics Computer System Significantly simplify operations procedures. Normal load and control functions are performed quickly and easily from control console. Operating characteristics of revised system include greatly increased speed, convenience, and reliability.

B79-10437
COMPILER VALIDATES UNITS AND DIMENSIONS
F. E. LEVINE (IBM Corp.)
Apr. 1980
KSC-11054 **Vol. 4, No. 3, p 449**
Software added to compiler for automated test system for Space Shuttle decreases computer run errors by providing offline validation of engineering units used system command programs. Validation procedures are general, though originally written for GOAL, a free-form language that accepts 'English-like' statements, and may be adapted to other programming languages.

B79-10438
A FLEXIBLE DATA BASE
E. R. COLE (Caltech), S. N. HIGGINS (Caltech), and R. L. WATSON (Caltech)
Apr. 1980
NPO-13777 **Vol. 4, No. 3, p 450**
Report describes hierarchical multilevel, multientry-point data file, and methodology of developing such file for unit-record-oriented system. Data base structure was prepared for Goldstone Energy Project where it is used in analyzing past energy consumption, predicting future consumption, and aiding design of buildings.

B79-10439
COMPUTING TIME- AND FREQUENCY-DOMAIN ANALYSIS
J. D. BROWNLOW

Apr. 1980
FRC-10121 **Vol. 4, No. 3, p 451**

Computer program Spectrum Analysis is developed to perform wide range statistical-estimation functions. It is rigorous tool for time-and frequency-domain studies. Program is written in FORTRAN IV.

B79-10440
LINEAR CONTINUOUS AND SAMPLED-DATA SYSTEMS
J. W. EDWARDS
Apr. 1980
FRC-10114 **Vol. 4, No. 3, p 451**

Program performs general analysis of linear and continuous, discrete and sampled-data systems using state-variable techniques. Program is especially suited analysis of linearized control system problems. It also can be used to model system described by combination of differential equations and Laplace transform blocks, such as aircraft control system.

B79-10441
MASS PROPERTIES OF A RIGID STRUCTURE
J. L. GILBERT, R. A. HULL, and P. J. KLICH
Apr. 1980
LANGLEY-12454 **Vol. 4, No. 3, p 451**

Program MASPROP rapidly calculates mass properties of complex, rigid structural systems. Its basic premise is that complex systems can be adequately described by combination of basic elementary structural shapes.

B79-10442
IMAGE-ANALYSIS LIBRARY
Innovator not given (College of Science of Texas A. & M. University) Apr. 1980
MSC-18178 **Vol. 4, No. 3, p 452**

MATHPAC image-analysis library is collection of general purpose mathematical and statistical routines and special-purpose data-analysis and pattern-recognition routines for image analysis. MATHPAC library consists of Linear Algebra, Optimization, Statistical-Summary, Densities and Distribution, Regression, and Statistical-Test packages.

B79-10443
MODERN PROGRAMMING LANGUAGE
G. H. FELDMAN (Caltech) and J. A. JOHNSON (Caltech)
Apr. 1980
NPO-14105 **Vol. 4, No. 3, p 452**

Structural-programming language is especially tailored for producing assembly language programs for MODCOMP II and IV mini-computers. Modern programming language consists of set of simple and powerful control structures that include sequencing alternative selection, looping, sub-module linking, comment insertion, statement continuation, and compilation termination capabilities.

B79-10590
OPTICAL COMPARATOR USES HOLOGRAPHIC SUBTRACTION
D. W. VAHEY (Battelle Memorial Inst.) and C. M. VERBER (Battelle Memorial Inst.)
Jun. 1980 See also NASA-CR-2829 (N77-28471)
LANGLEY-12126 **Vol. 4, No. 4, p. 583**

Integrated optical comparator compares reference and signal voltages by their effects on coherent light beam. If both voltages are same, beam is essentially unperturbed. If voltages differ, light is deflected by previously recorded hologram to detector.

B79-10591
NUMERICAL ANALYSIS OF COMPLEX FLUID-FLOW SYSTEMS
R. L. HOLLAND (McDonnell Douglas Corp.)
Jun. 1980
M-FS-25125 **Vol. 4, No. 4, p. 584**

Very flexible computer-assisted numerical analysis is used to solve dynamic fluid-flow equations characterizing computer-controlled heat dissipation system developed for Spacelab. Losses caused by bends, ties, fittings, valves, and like are easily included, and analysis can solve both steady-state and transient cases. It can also interact with parallel thermal analysis.

B79-10592
GENERALIZED PLOTTING AND CONTOURING PACKAGE
D. RUBIN (Computer Sciences Corp.)
Jun. 1980
GSFC-12367 **Vol. 4, No. 4, p. 584**

PLOTPAK is complete general purpose plotting and contouring package. Flexible and easy-to-use system, it produces line-printer, television-screen, and DICOMED plots. Plots, from quick and simple to complex and sophisticated, can be generated with only basic knowledge of FORTRAN and PLOTPAK commands.

B79-10593
VITERBI/ALGEBRAIC HYBRID DECODER
R. W. BOYD (Mississippi State Univ.), F. M. INGELS (Mississippi State Univ.), and C. MO (Mississippi State Univ.)
Jun. 1980
M-FS-25095 **Vol. 4, No. 4, p. 585**

Decoder computer program is hybrid between optimal Viterbi and optimal algebraic decoders. Tests have shown that hybrid decoder outperforms any strictly Viterbi or strictly algebraic decoder and effectively handles compound channels. Algorithm developed uses syndrome-detecting logic to direct two decoders to assume decoding load alternately, depending on real-time channel characteristics.

SUBJECT INDEX

Subject Index

The title of each Tech Brief is listed under several selected subject headings to provide the user with a variety of approaches in his search for specific information. The Tech Brief number, e.g., B79-10044, is located under and to the right of the title and is followed by a two-digit number, e.g., 03, which designates the subject category in which the entire entry can be found.

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Personal Author Index

This index is arranged alphabetically by author. The Tech Brief title is listed followed by the originating Center number, e.g., GSFC-12404. The Tech Brief number, e.g., B79-10286, is followed by a two-digit number, e.g., 08, which designates the subject category.

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